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Notes on Manhattan Placers, Nye County, Nev.

The Pay Gravel, 2 to 4 Ft. Thick, Lies beneath an Overburden of 35 to 90 Ft. and Is Mined through Shafts. Said to Average $10 per Yard

BY CHARLES COLCOCK JONES*

The following observations were made during a recent examination of the Manhattan, Nev., placers generally and certain properties in particular. Regarding the formation, W. H. Emmons and G. H. Garrey in "Notes on the Manhattan District," have so well expressed general conditions that I quote from their paper.

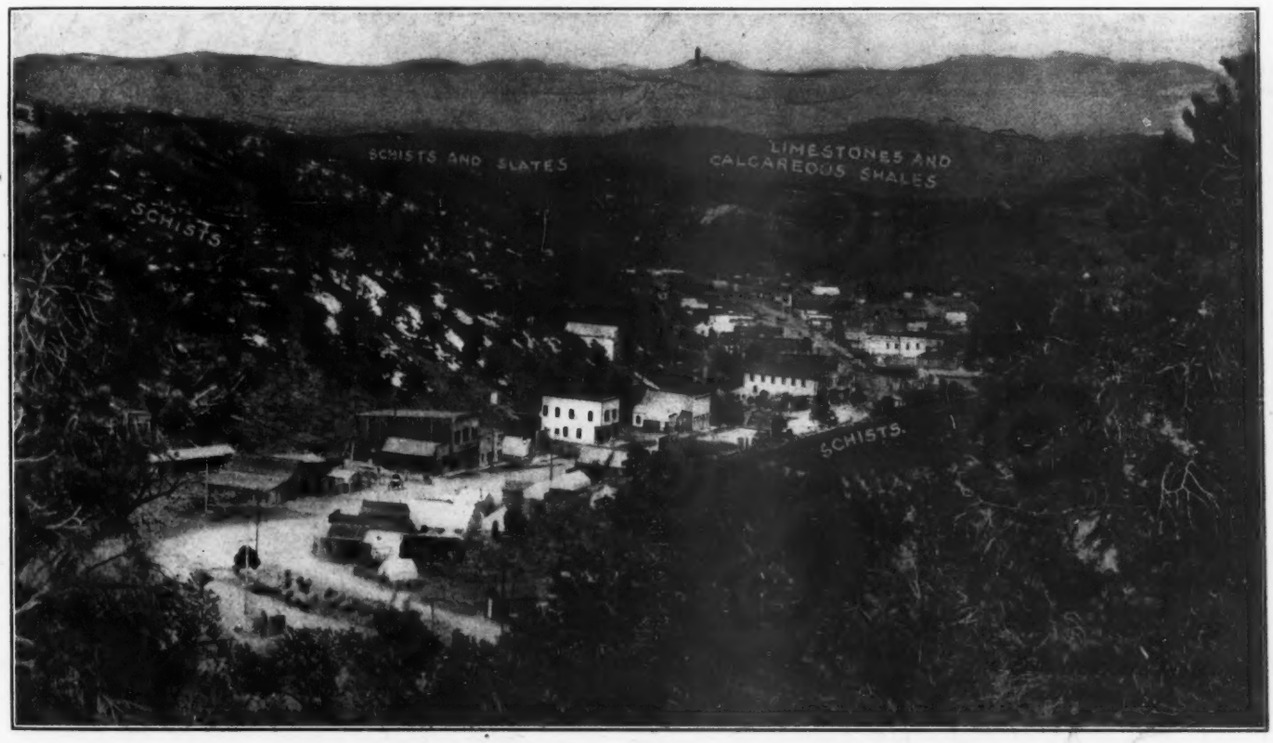
"The rocks around Manhattan include slates, limestones, quartzite, diorite, porphyry and rhyolite; the orebodies so far discovered are in the sedimentary rocks.

Sedimentary Rocks

"The slates, limestones, and quartzites which make up the sedimentary series at Manhattan are exposed for two or three miles along the Tonopah road, and about as far on the road to Belmont. S. F. Emmons describes a series of slates, limestones and quartzites at Belmont closely resembling these and G. A. Gilbert further notes that the slates at Belmont contain Silurian fossils, and estimates their thickness at from 4500 to 5000 feet. The slates at Manhattan are probably of the same age.

"Near Manhattan, as at Belmont, the sedimentary rocks are extensively metamorphosed and consist for the most part of dark, fine-grained mica schists or phyllites. The limestone layers are in most cases less than 30 ft. thick and probably will be found not to persist for very great distances. Usually they have been entirely re-crystallized and in some places changed to an impure, gray marble. Quartzite layers also occur interbedded with the belts of schist. A quartzitic breccia or conglomerate layer less than 20 ft. thick, made up chiefly of large subangular quartz fragments occurs near the Reilly fraction, dipping with the schists.

"At Manhattan, the glossy or satin-like phyllites or fine mica schists predominate over other members of the series. These are present in considerable variety but the most common facies is one which in hand specimens appears to be composed almost entirely of biotite. Microscopic study shows that this schist consists chiefly of biotite, muscovite and quartz. The mica forms interlocking folia in perfect alinement with the schistosity, inclosing small grains of quartz having also a pronounced, though less perfect, lineal arrangement. In certain facies crystals of chlorite and magnetite cut across the laminæ of the mica in a manner which shows that they were formed after the schistosity was produced. The schistosity, as a rule, is approximately parallel to the bedding, as determined by contacts of limestone and slate.



MANHATTAN, NEV.—LOOKING DOWN THE GULCH TOWARD SMOKY VALLEY

Ore Deposits

"So far as developments have shown the ore deposits of the Manhattan district are confined entirely to the area of metamorphosed sedimentary rocks, which is surrounded by rhyolite, granite and alluvium. The orebodies are: (1) Nar-

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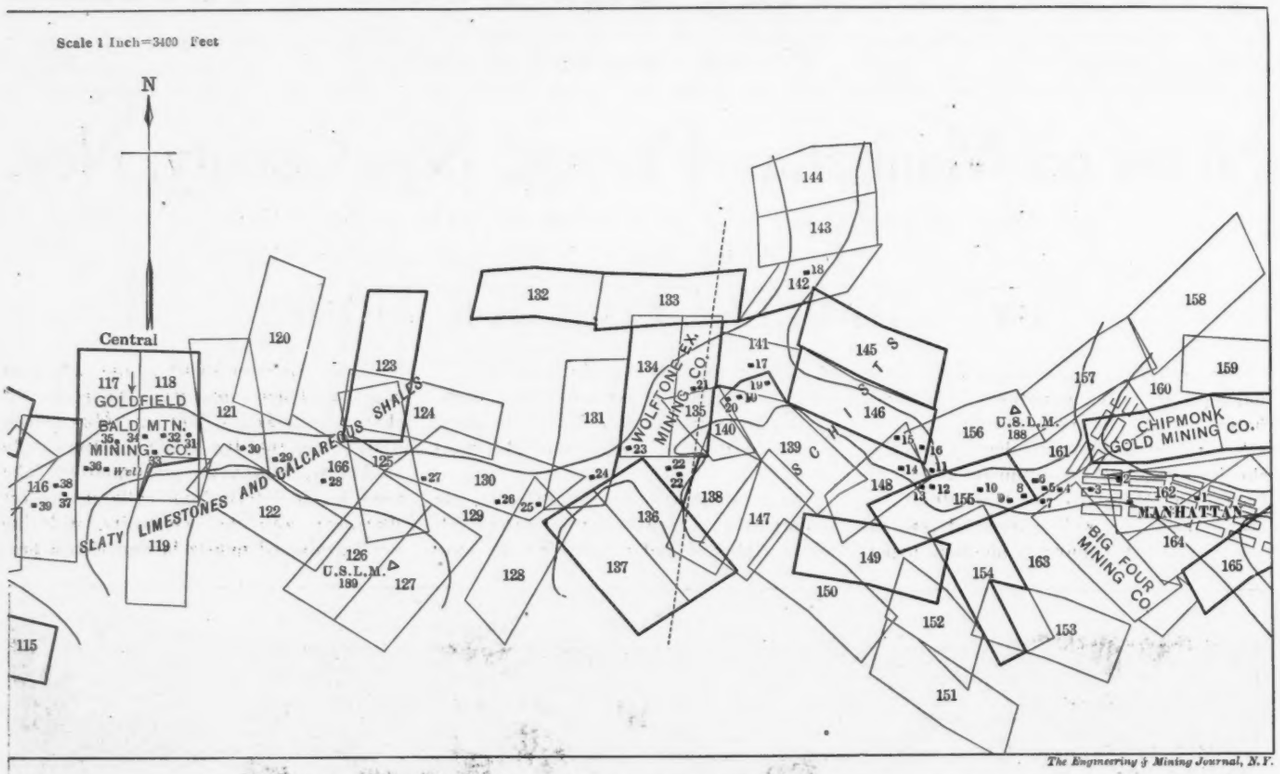
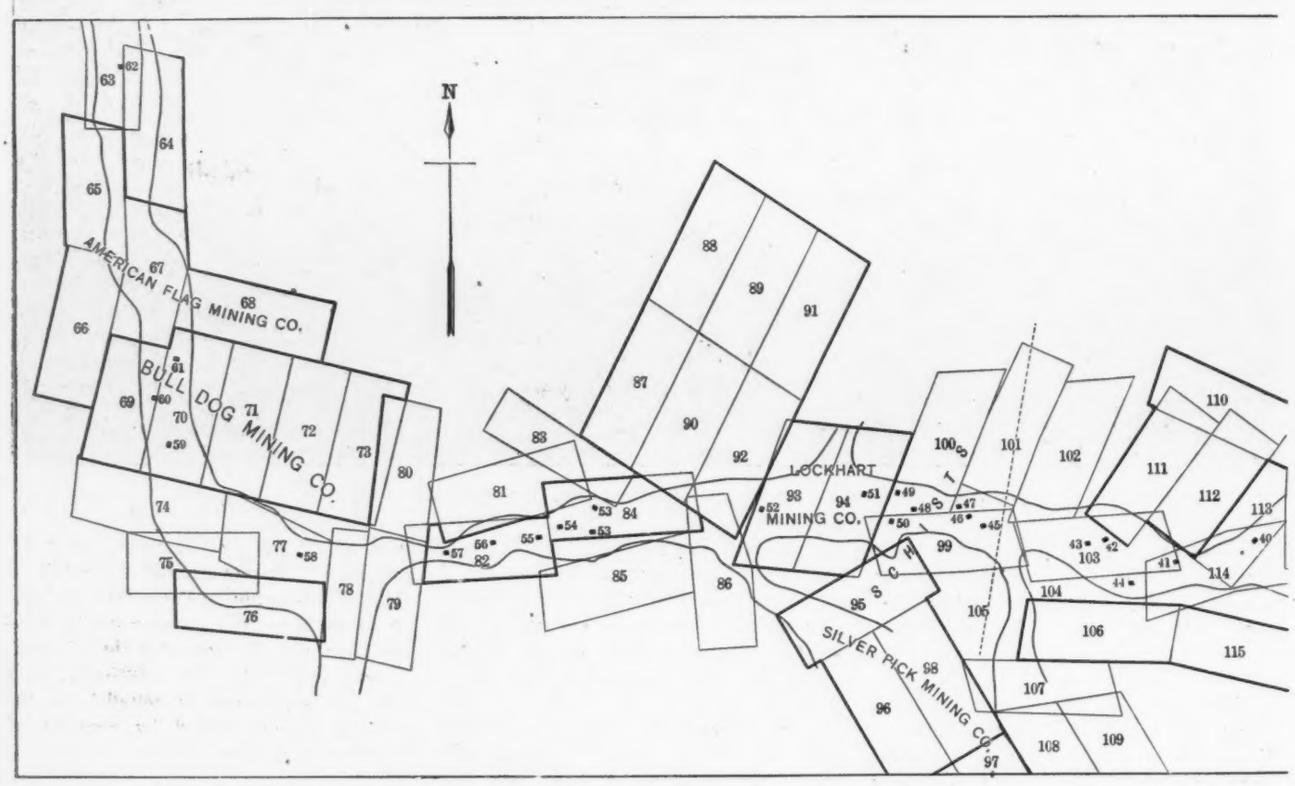
[1] *Bull.* No. 303, U. S. Geol. Surv., 1907.



MANHATTAN GULCH PLACERS, NYE COUNTY, NEVADA—UPPER END. MAP BY LIDDELL & LIDDELL



MANHATTAN GULCH PLACERS, NYE COUNTY, NEVADA—WEST END

row, tabular lode deposits occurring in rather continuous veins crosscutting the bedding and schistosity of the metamorphosed sediments; (2) deposits interlaminated with the schistosity; (3) deposits parallel to bedding planes of the quartzites, shales and limestones and replacing part or all of the limestone or calcareous layers.

"Most of the principal ore-bearing fissures of the district, so far as could be learned from a considerable number of compass readings, strike north or a few degrees west of north. * * * The dips of the principal veins range from 45 to 90

deg.; but a majority of them are inclined to the southwest at angles ranging from 60 to 70 deg. That there has been extensive faulting in the ore-bearing rocks is shown by brecciated zones and polished striated walls, exposed by mining explorations. Fractures traverse the slate, limestone and quarzite layers in all directions and along some of them the beds have been displaced."

Manhattan experienced a boom in 1905 and 1906, and very large sums of money were spent in building mills and trying to open paying mines in the schist and the slate and calcareous belts with rather disastrous results. There is a wide distribution of gold in the schist and other formations as interlaminated leaf gold, disseminated grains, crystallized gold in vugs, and as masses of considerable size, but from their character the deposits have been of a nature more profitable thus far to the leaser, or pocket-miner, than to an organized company. The formation as a whole was favorable to erosion and a concentration of its disseminated gold values in the gulches, following the lines of least resistance.

Topography

The rounded summits, soft outlines and easy grades of the Manhattan gulches are in strong contrast to the rugged outcrops of other Nevada camps in the volcanic rocks. The topography of the region indicates a widespread and deep erosion the greater part of which was tributary to the main Manhattan gulch. This gulch begins in a divide of the range about 1½ miles east of the town of Manhattan at an elevation of about 740 ft. A bench mark near the middle of the town reads 7021 ft., A. T.; at central the elevation is 6682 and at shaft No. 36 on the Happy Day claim it is 6350 ft., making an average grade of about 3½ per cent.

Beginning at the summit, the formation from there to the point of Wolftone hill opposite shaft No. 21, a distance of 2½ miles, is schist with intercalated lime beds, having a general north and south strike and a dip of 20 to 45 deg. to the west. From Wolftone hill to about shaft No. 45 on the Fairview claim the formation is a series of beds of slate, limestone and calcareous shale, lying flat or dipping slightly to the west.

Another belt of schistose rocks with dip to the west continues westward until covered on the lower slopes by alluvium merging into the Smoky Valley. As will be noted from the map, the gulch runs nearly east and west for a distance of four miles when it takes an abrupt turn to the north and two miles below ends in Smoky Valley.

Discoveries of Placer Gold

The early history of the discovery of placer gold is a trifle vague, but the facts are about as follows: The Dexter company in the fall of 1905 found colors in sinking a well for water in the gulch in the lower part of the town, but paid no attention to it. In the summer of 1906 nuggets were discovered at the surface on a bench above the gulch, on the Little Grey claim opposite shaft No. 12 by a miner named Burns. Throughout that summer and to the present time this bench channel has been worked in a southeasterly direction. The dirt is wheeled in barrows to sluice boxes and washed with water pumped from a well in the gulch.

In April, 1908, when mining in this camp was practically at a standstill, William McDonald, a placer miner from California, believing the gulch would pay, secured a lease on the Nellie Grey and sank shaft No. 13. He reached bedrock in 23 ft., finding pay gravel 5 to 7 ft. thick, which averaged $10 per yard and cleared several thousand dollars before his lease expired.

In 1905 a well had been sunk 45 feet to bedrock at Central, and gold had been found in the gravel, but the circumstance was overlooked in the rush for lode claims. However, the owners at Central, Auxier, Hayward & Crews, on the strength of McDonald's find, put down shaft No. 35 to bedrock, finding 3 feet of rich gravel. The sinking of this shaft and proving the gravel at Central was the real inception of gulch mining in Manhattan.

Thomas Wilson, familiary known as "Dry Wash" Wilson from his successful placer work at Round Mountain, immediately acquired and completed shaft No. 24, dropping into a wet channel that

GOLDFIELD & BALD MOUNTAIN SHAFT—HEADFRAME WILL BE ON SUPERSTRUCTURE TO MAKE DUMP ROOM

MIDDLE PORTION OF MANHATTAN GULCH, NEV.—LOOKING WEST FROM WOLFTONE HILL

THOMAS (DRY WASH) WILSON'S WORKINGS—SHAFT NO. 25

SHAFT 30—LIMESTONE AND CALCAREOUS SHALES ON THE RIGHT

produced ample water and the largest nuggets found to date, ranging from 5 to 30 dwt. From this time in March until the present date, May 24, there have been over 60 shafts sunk to bedrock varying from 35 to 90 ft., the latter being at shaft No. 63, the farthest west. Nearly all of these shafts have shown pay gravel from 2 to 4 ft. thick running from $5 to $30 per yard.

The Pay Gravel

About 25 per cent of the pay gravel consists of subangular boulders of limestone, quartz and quartzite, rarely exceeding 1½ cu.ft. in size, and generally of a convenient size to handle by one man; the other 75 per cent. is made up of sand, gravel and flat pieces of shale and limestone. Above the pay gravel is usually a foot or two of fine micaceous silt-like mud from the erosion of the schists; the balance to surface is made up of flat pieces of shale, limestone and limedust. The gravel stands so well that in sinking the prospect shafts the only timber used is a crib of two or three hewed poles as a collar to support the windlass. Two men, one on the windlass, can sink a 4x6-ft. shaft, on an average 8 ft. per day, down to 40 feet.

The gold is coarse, very few particles weighing less than half a grain, and from that up to several pennyweights with occasional large nuggets; it is generally flat in shape and only partially rounded. In fineness it approximates 770, the balance being silver, and averages $15 per oz. From washings and pannings made by myself of measured amounts I consider it is safe to say that $10 per cu.yd. is a fair estimate, judging from the work done to this date in the gulch. This is confirmed from other reliable sources, and by careful inquiry among the banks, handling the bulk of the gold, I find that at this date, with the crude apparatus being used, in excess of $1000 per day were being produced during May.

Electric Power Now Available

The Nevada-California Power Company has recently completed connection with the line at Millers, and by June 1 power will be available at Manhattan. This company has designed and proposes to supply the different operators with a complete plant consisting of headframe, 20-h.p. hoist, pumps and dynamos, and to furnish power at a reasonable cost.

The first plant to go in under this arrangement is for the Goldfield & Bald Mountain Mining Company, at Central, on shaft No. 36, which has been sunk 45 ft. to the bedrock, finding ample water. To secure dump room, the headframe will be elevated 20 ft. above surface. A sump of sufficient capacity will be made in the mine and tank capacity will be provided on the surface for 100,000 gal. It is proposed to drive a central gangway to the extreme east limit of the block of ground, with laterals north and south to the "rim rock" and to adopt a modified longwall system using a minimum of timber.

The lines on the map indicate where the flat ground of the gulch is limited by the steep sides of the hills. These sides, or "rim rock" dip at an angle of 30 to 45 deg. so that the actual channel is less in width by about 100 ft., and so far as can be seen from the many prospect shafts the actual channel is comparatively flat and not V-shaped. A fair average width of the pay channel throughout the gulch would probably be 350 ft. and allowing for all contingencies, if the results from the haphazard shafts sunk throughout a length of 6 miles can be used as criteria. I estimate that the main gulch alone should produce gold in excess of $20,000,000 and capable of being extracted in a reasonable time.

I am indebted to Percy M. Train, who has been a resident at Manhattan for some years, for much interesting and valuable information. Mr. Train is the discoverer of trainite in this district, a phospho-silicate of lime and alumina, a mineral having possibilities as a semi-precious stone. In his collection from the district Mr. Train has some of the most remarkable specimens of crystallized gold, leaf gold and masses that I have ever seen.

Except for the lack of water the main Manhattan gulch reminds one strongly of Alder gulch, Montana. In a few instances I am informed gold has been found in the general gravel above the "pay gravel" running as high as 50c. per yd. Under present conditions of small ownership the value of the upper gravel is not a commercial one, but may become so after the exhaustion of the rich gravel and the bringing of water under sufficient head to sluice out the gulch as a whole. The value of these upper gravels will be determined during the course of the present operations. The accompanying photographs will give an idea of the various rigs in use at the present time; with the advent of cheap electric power more systematic work and more substantial equipment will become the rule.

Le Roi Mining Company Limited

Special Correspondence

The report of the directors of this British Columbia company for the 15 months ended Sept. 30, 1908, states that the operations of the company for that period have resulted in a loss of £24,895. During the 15 months 100,444 tons of ore, averaging in gold 0.363 oz., silver 0.55 oz. and copper 1.22 per cent., equal to a value of $11.11 per ton, were mined and shipped to the smeltery at Northport. The results for the period were seriously affected by the heavy fall in the price of metals and also by a great falling off in the gold contents of the ore shipped in the earlier months of the fiscal year. The tonnage treated has been considerably less than in the two previous years causing an increase in the mining costs per ton. The operating expenses at mine and smeltery for the last three years are given in the accompanying table.

COSTS AT LE ROI.

	1906.	1907.	1908. (15 months)
Tons shipped.....	110,042	131,696	100,444
	Cost per Ton.	Cost per Ton.	Cost per Ton.
Mining, including depreciation and amount written off exploration and development.....	$4.46	$4.04	$5.73
Smelting and realization (direct and indirect), including freight, interest, depreciation, etc.....	6.04	5.98	5.98
	$10.50	$10.02	$11.71

During the year the company acquired the remaining interests in the Pack Train mineral claim which adjoins the Le Roi to the south, a share in which was purchased some years ago. The mineral property now owned by the company forms a block of about 142 acres in the center of the Rossland mining belt and a large part of which is virgin ground. The director's report is accompanied by reports from the consulting engineer, W. A. Carlyle, late general manager of the Rio Tinto mine, from the managing director and from the mine superintendent. Mr. Carlyle's report refers to an important discovery, on the 1650-ft. or lowest level, of an ore shoot now 200 ft. long and 4 to 12 ft. wide and of excellent grade; another shoot of good ore on the same level has been opened up for a length of 100 ft. and may be a continuation of the first ore discovered, in which case the ore shoot will have a length of at least 330 ft.

Of the ore extracted from these new openings during the six months ended Oct. 31 there were 4000 tons having, according to this report, an average value of $20 per ton. These shoots are in the South vein and are the downward continuation of the ore found some years ago on the 1350- and 1450-ft. levels. The discovery of such good ore in the deepest part of the mine is encouraging and warrants extensive development. The reduction works at Northport smelted during the fifteen months 124,263 dry tons of ore. The matte shipped was 2780 tons, yielding returns of $1,164,912 equal to $418.97 per ton. Owing to shortage of coal and coke the smelting plant was closed down for about three weeks in August, 1907.

The accounts of the company show that liberal amounts have been written off on account of mine exploration, development and depreciation. The issued capital is £1,000,000 divided into 200,000 shares of £5.

Clay Mining and Its Relation to Coal Mining

A General Lack of Organization and Excessive Freight Rates Have Tended to Make This Little Known Industry Generally Unprofitable

BY RICHARD R. HICE*

Old as the clay industry is, and much as has been written regarding it, the ceramist of today freely admits he knows but little about it.

Where other industries have advanced, the clay worker has made but little progress, due largely to the want of organization among the manufacturers, coupled with the jealousies always present when working by the "rule of thumb," and not controlled by the knowledge obtained through technical investigations.

Ries, in his monograph on the "Clays of the United States East of the Mississippi River" has given us a practical definition of clay, and one broad enough to include all materials that can be used by the ceramist, which are not, in all cases, technically clays. He says, "The term clay is applied to a natural substance or rock, which, when finely ground and mixed with water forms a pasty, moldable mass that preserves its shape when air dried, and when burned changes to a hard, rock-like substance by the coallescence of its particles. through softening under the action of heat." There is nothing technical in this statement, but it is thoroughly a practical definition.

For many years the only knowledge we professed to have of clays was chemical, and we have been flooded with the results of ultimate analyses—confronted all the while with the fact that clays with the same ingredients, in essentially the same quantities, did not act alike when used in practical work. The geological reports of the past have been filled with analytical tables, the value of which is practically nothing, as we cannot tell from them how any one of the clays will behave, either in molding, in drying, or in burning.

Characteristics of Clay

Clay is never a simple chemical unity, but is always a mechanical mixture of a number of distinct chemical compounds. The recognition of this fact explains why a chemical analysis fails to give us any real knowledge of clay. The present study of clays gives but little attention, therefore, to the chemistry of raw materials, but most of the present work is in the line of practical applications only. What is needed in the way of real technical work on clays, lies in devising methods by which we can distinguish the various minerals present in the clay, and then learning the character and behavior of each, so that we can tell regarding any new combination presented to us. As an example of the want of value of a chemical analysis as generally made, let me simply mention that marcasite and pyrite, minerals of identical chemical composition, do not act the same when compounded in a clay body.

When I began to look up what has been written regarding the clays of this region I turned at first to the reports of the Second Geological Survey, and then to the scattered references in the publications of the United States Geological Survey, and I was disappointed in both. The references to clays in these reports are few, and of little value. This is due in part, at least, to the fact that the clays had been but little worked at the time of the Second Geological Survey, and the references there made are mainly in the way of chemical analyses; there have been but few geologists who have realized the great value of clays and the clay industry. Without going into figures, let me recall the fact that Pennsylvania ranks second as a clay-producing State, and if we eliminate pottery, it ranks first, and more especially does it stand forth as a producer of refractories, of which it is also the largest consumer.

There are at least five easily distinguished kinds of clays in this region. On the surface we have some clays due to the direct decay of the underlying rocks, and along the streams there are some deposits of sedimentary clays, generally in small quantities. These two classes of clays do not interest us at this time. Then there are the large deposits of shales found throughout the coal measures, clays of varying composition, and generally little value. These, also, hardly come within the bounds of the present subject. There remain the "flint" clays and the plastic "underclays" of the coal measures, which I take it are the only ones of direct interest to the coal miner.

The flint clays are largely found in the "Mercer" group and in the "Mahoning" sandstone. These horizons are without the limits of the workable coals, unless locally, and are not therefore of direct interest to the coal miner, except as the clays can be mined and used with other materials in the production of high grades of refractories.

The clays from these horizons differ somewhat in their character, and it has been thought this difference is such, and so general, that the proportions of silica and alumina present will indicate from which horizon a clay is derived. This, however, cannot as yet be stated as an established fact, although a study of the differences in the conditions of the deposition may show such a general difference in composition not impossible.

No Value in an Ultimate Analysis

While all the flint clays do not make equally good refractories, yet there seems no such difference in practice as is indicated by their chemical analyses. Among the published analyses of clays from this general region I note that the percentage of silica ranges from 40.820 up to 64.830, or higher, and the alumina runs from 38.010 down to 23.950.

It is, of course, no wonder that when we find a range of over one-half in the proportions of these two basic ingredients of clays, used for the same purposes, that we conclude there is no value in an ultimate chemical analysis.

While the Mercer group and the Mahoning are the main horizons for the flint clays, yet we have other valuable deposits of these minerals constituting at times portions of the underclays of the Allegheny river series. The deposits at these horizons are for the most part, however, irregular, and of relatively little value. An exception to this general statement is to be made, however, in reference to the Bolivar clay. There has been some confusion regarding this clay. Frequently it has been confounded with the Upper Freeport clay, and so called in geological reports. It belongs properly below the horizon of the Upper Freeport clay, at, or near, the horizon of the Upper Freeport limestone, and has been often spoken of as replacing the limestone, and occupying its place in the column. Whether, or not, this is correct I do not think has been definitely settled. The limestone seems to be absent without the clay being present, and is so irregular at all times that such a statement can only be based on an extended series of observations over the whole of the region covered by the Freeport series.

While the flint clays are so valuable in the productions of refractories, yet to the coal miner they are not of such direct value as the plastic clays underlying the various workable coal beds, and in this section these are mainly confined to the Allegheny river series. There is no coal horizon between the top of the Homewood sandstone, and the base of the Ma-

Note—Paper read at the summer meeting of the Coal Mining Institute of America, Punxsutawney, Penn.

*Beaver, Penn.

honing that does not have underlying it a clay bed.

Often these are not of workable dimensions; often they are so impure as to be of no value. Their character is in no way related to that of the overlying coal, nor does the character change in any way with a change in the character of the coal, or *vice versa*. The coal may be utterly worthless, yet the clay may be among the best of the plastic clays of the series, and on the other hand we often find a good coal, of a good thickness, and the underclay without value, or practically wanting. A clay will often change in a short distance, not only in thickness, but in quality and characteristics as well, so the fact a clay is of good value at any point does not mean it will be of equal value even one-fourth of a mile distant. While this is undoubtedly the rule, yet in the case of some of the clays they seem of a uniformly valuable character over quite large areas; the best known of these valuable districts in Pennsylvania probably being the Beaver river section, where the Lower Kittanning clay is uniformly developed over a large area, and while not uniform in character, yet possesses good workable qualities wherever it has been opened. Throughout that district the overlying coal is of little value, as is generally the case with all other clay horizons.

Question of the Underclays

The question of the underclays presents itself to the coal miner in a number of different ways. There is necessarily, in many cases, a portion of the underclay removed to facilitate mining. Generally this is mixed with the other refuse from the mine so that it is of no practical value. To use this portion of clay it is necessary that it be kept by itself, and not contaminated with the other waste materials, or by the waters from the mine. The amount of clay thus necessarily taken from the mine is generally small, and is not of sufficient amount to supply a modern clay-working establishment of itself. There are cases where the clay thus mined, being of a high fire-resisting quality, and plastic as well, can be used as a binder in working some of the clays derived from the flint horizons, or it might be mixed with shales and thus used in making some of the lower grades of brick. To do this, however, there must be a proper relation of market to the location of the plant, for these lower grades of brick will not permit of shipment to any great distance, especially under the present freight classification of brick, by which they take a higher freight rate than grain or grain products, or other articles of many times the value of clay goods, ton for ton. Of course it may be feasible in some cases to mine other clay from the mine after the coal has been removed, but this means the rooms must be kept free of all slate and other waste materials, and the water not allowed to accumulate until after the clay has been removed, and it may be questionable whether it will not be cheaper in all cases to mine the clay for itself from an independent opening, especially when by so doing a better clay can be had from a different horizon.

This brings up what seems to me is the real question for a coal miner to consider in reference to clay working, and that is whether or not he can mine a clay for itself, at or near the place where he mines his coal, and produce therefrom a product that will be profitable in itself, and not a mere hanger-on to his coal business.

Points to be Considered

This, of course, is a complicated question. The grade or quality of clay is the first question that presents itself. As there are a number of clay horizons, and the character of each clay is constantly changing as above mentioned, this question in the present state of our technical knowledge, or rather want of knowledge, resolves itself into one of a practical nature, under everyday conditions of manufacture.

A test of this character is not always easy to accomplish; however, it is the only real method of trying a clay, and no small laboratory, or semi-laboratory test will prove satisfactory. There must always be sufficient clay tested to give real practical factory conditions; and sufficient material to make up a small kiln of ware is desirable. At times a series of preliminary trials will be necessary, to obtain indications of the methods of manufacture to be followed in the real testing. We recently had such a case in our own experience: We had received a car of clay from Montana for trial; in this case, however, there were four different clays in the car, and we knew nothing of the conditions under which they were found, or how the samples were procured, and we had no experience with clays from that region. There was not sufficient of any one kind to permit any waste of material, so we made up a lot of small trial pieces by hand, carefully noting the behavior of the clay in molding and in drying, and then by placing these samples in different parts of the kiln, we obtained some knowledge of the behavior in burning, comparing the trials at all stages with materials of our own which we were using every day; and having run through a lot of these trials we were then in position to begin the real testing of the clays. It is generally believed that considerable knowledge can be had of a clay by mere inspection. Such is not the case. Where a person is familiar with a clay closely associated with one under investigation and knows regarding the surroundings from which it has come, experience will suggest the line of trials to be pursued, but the first actual trials may show deductions entirely wrong. A light colored clay may in use burn a very light color, or it may burn dark, while on the other hand a dark colored clay may burn white, the coloring matter being entirely organic and driven off by the heat of burning.

Securing a Proper Sample

In procuring a trial sample of clay, great care should be taken to secure a true average sample. A sample from the crop is worthless. It is weathered to such an extent that nothing can be told of the deeper-lying portions of the bed. Many of the impurities have been dissolved and washed away. The effect of the weathering has been to make the clay more plastic, and render it more difficult to dry. The particles have been broken up so that a smoother, denser article is produced. Excessive weathering in one way is an approximation to washing and hence the crop may indicate a use that will be found impossible when once under good cover, and away from the surface. For example, the crop often indicates a clay can be used for pottery of some sort, the excessive weathering, together with the accompanying washing away of impurities, permitting of its being readily molded; however, when followed into the bank, it is found there is but a relatively small portion of the clay that is washable, and the impurities are such that ware of an entirely different character is produced, with a great loss in breakage, and, often, such a high fire is required that pottery cannot be made at a profit—the vitrifying point being the point of destruction, or nearly so. At least one clay in this Pennsylvania district that has been used for pottery purposes has this character, resulting in such loss in burning as to really destroy its usefulness for the purpose used.

It is probable that most of the uses for the underclays of central Pennsylvania will be for sewer pipe, for street-paving brick, for building brick of various colors, or articles of such nature. For these purposes clays need not be of very great fire resisting quality, for these goods are generally burned at a relatively low heat, most of them being burned at or below cone No. 8. This is the heat generally used in pottery work in this country, and where a lower heat can be used, and good, dense ware produced, it is better, and the fuel cost is just that much less. Clays for the purposes indicated can have a large percentage of impurities present, for the matter of color, except in the case of face brick, is not important, indeed there seems to be a general preference in the markets for the darker shades of these goods, which are generally supposed to indicate a high degree of vitrification, not, however, necessarily so. In the matter of face brick, undoubtedly, the ideal clay is one that will burn a white color, or at most a very light buff, in which case the color desired can be readily produced by the introduction of the necessary metallic

oxides. Where these are in the clay in its natural state, they always vary in amount, and the coloring value being high, there is a corresponding variation in the color of the finished goods. Most of the classes of goods mentioned also require a clay that will flash, that is, under the action of the kiln gases, as these necessarily vary from time to time during the burning, there is produced on the surface of the ware a species of glaze, which we know as flashing the ware.

This is of all kinds of colors and shades from an imperceptible gloss, through a long line of yellows and browns, to a shade that is almost black. For the manufacture of sewer pipe, or salt-glazed brick, such a clay is almost a necessity, to produce that good, solid glaze, of the dark color so much desired, and which is such an essential in good sewer pipe. That most of the underclays of central Pennsylvania are of the grade or quality, and possessed of the requirements to produce the goods of the classes indicated, is undoubtedly the case, and this being so, the question is whether they can be profitably worked under all the existing conditions. This is a question that can only be determined for each particular case itself. The character of the clay will determine the possible uses, and then the question of cost of production, of cost of marketing, and prices in the available markets, will determine whether the business can be carried on at a profit.

Permanent Plants Should be Built

Clay-machinery men are constantly hunting up new possibilities in the matter of locations, and it is not an uncommon thing to hear that a brick plant can be erected at the cost of a dollar per brick of daily capacity. Such a factory will not prove profitable. The day of temporary structures is past. Heavy permanent buildings, permanent kilns, thoroughly drained and paved yards are a necessity today, and there is no doubt it will be but a short time until any uptodate brick plant will be operated entirely by electricity. There are too many advantages in this kind of power not to use it. The tendency is constantly toward larger plants, and plants that will in all cases be operated throughout the entire year.

As yet there has been but little organization among any of the brick people, aside from some of the firebrick makers, but it will be only a short time before the makers of other classes of brick must get together. As it is today, it is a time of ruinous competition, without any necessity of such being the case, and many plants have gone out of business, with a great loss of money. Many plants are today merely existing, being carried on in the hope of something turning up that will allow them to make a profit, while there are some, that owing to location, to the character of the goods they make, to the fact they make some kind of special line, have been and are making fair profits. In the absence of organization, the matter of freight rates is much against the clay manufacturer.

There are gross inequalities here that only can be remedied by organization, and no logical reason can be assigned for the present rates, they are either entirely too high, or there are other classes of goods that are being carried at a loss to the railroads of the country. These are some of the factors that must be considered. Like any other business, the clay industries have many sides, all of which need to be studied, and it is not only the possibilities from a mere manufacturing point of view that need consideration, but as in all other ventures it is the view from the business side that must in all cases determine the real possibilities of any clay working.

The Lemoine Diamond Case

Special Correspondence

The Lemoine case, which came to a termination last February owing to the absconding of Lemoine, has been reopened. Lemoine was accused of defrauding Sir Julius Wernher, the well known South African financier, of large sums of money by professing to have discovered a process for making artificial diamonds. Lemoine was tried in Paris and sentenced to 10 years imprisonment. He has now reappeared and seeks to have the judgment set aside, still maintaining that his process is a success, and that he is going to sound the death knell of the diamond. The evidence brought before the court all went to show that Sir Julius Wernher was the victim of a trick, it being stated that several of the stones which Lemoine claimed to have produced were marked stones which had been slipped into the crucible by Sir Julius' agents. The case was adjourned until June 14, to allow time for a further examination of the process by experts, but there is no reason to doubt that the verdict will be that a hoax, unparalleled for impudence, has been practised on one, who from his position as head of the De Beers company, having at his command the ablest expert advice, was of all men least likely to be imposed on by a trick of this sort. Later Lemoine was sentenced to a term in jail.

The United States produced no nickel from domestic sources in 1907 but in 1908, according to statistics of The Mineral Industry, the output amounted to 14,000 lb., worth $7000. The North American Lead Company, of Missouri, was the only producer.

The new Sultan of Turkey has given to the nation the Thassos mines and the rich oil seams of Mesopotamia. An Anglo-Australian syndicate has been constituted with the Deutsche Bank to work them.

High Silica Slags at the Magistral Smelter—I

By C. A. Heberlein*

On March 31, 1909, the Magistral smelter at Zacatecas, Mex., was blown in to treat the ores of the Magistral mine. The smelter was designed by me, and especially constructed to treat silicious ores. The furnace is water-jacketed for 7 ft. above and 2 ft. below the tuyeres, and was built by the El Paso Foundry and Machine Company, of El Paso, Texas. Air is furnished by a Connellsville blower of 67 cu.ft. displacement. The forehearth is 9 ft. long, 3 ft. deep, and 2 ft. wide; it is placed on rails, and easily removable. The tuyere area of the furnace is 46x150 in., with 16 tuyeres of 5 in. diameter, 8 on each side. The feed floor is 12 ft. above the tuyeres. On account of the intention of running a highly silicious slag, an ordinary cast-iron tap jacket was placed in front for intermittent tapping. The top of the furnace is constructed of red brick. The gases are conducted by a steel uptake to a brick stack 103 ft. high. The total elevation of the top of the stack above the charge is 127 feet.

Operation of the Furnace

The furnace was blown in on an easy charge which gave a slag carrying 46 per cent. SiO_2, and ran very nicely. The coke in the charge was 12 per cent. Through lack of space at the mine a very silicious low-grade ore was first sent to the smelter. As all work was suspended at the mine on account of Holy Week, there was nothing else to do but smelt this material. The slag soon ran from 46 to 52 per cent. SiO_2, when unfortunately a check valve at the boiler gave way, necessitating the banking of the furnace with this highly silicious charge for 36 hours. The furnace started without trouble, except that the six back tuyeres remained dead. The furnace was banked April 2, and started on the evening of the 4th. It ran rather smoothly on the 5th, with the same silicious charge, but began to pick up on the 6th, when the total tonnage went up to 141 tons, and two more tuyeres were gained. On April 5 the coke in the charge was reduced from 12 per cent. to 10½ per cent.; again, on April 13, to 9 per cent. With this reduced coke the tonnage increased gradually up to 190 tons, when on April 26 the coke was reduced to 8.1 per cent., or 6.96 per cent. fixed carbon. On account of the low ash Pocahontas coal is used. Analyses of the slag from day to day is shown in an accompanying table.

From April 5 to 26, no extra coke charge was added, and the return slag and spillings amounted to about 2 per cent. in the charge. The charge consists of ore,

*Mining engineer, Zacatecas, Mexico.

iron and lime. The iron ore comes from Durango and the lime from our own quarry about 1000 m. from the furnace. The air consumption now averages be-

ANALYSES OF SLAGS AT MAGISTRAL SMELTER.

	SiO_2	FeO	CaO
April 5	46.4	32.1	18.7
April 6	48.0	29.1	18.8
April 7	53.0	26.1	21.5
April 8	49.0	22.6	20.4
April 9	49.6	21.7	22.0
April 10	51.0	22.7	20.8
April 11	50.0	22.8	20.5
April 12	49.8	22.2	22.7
April 13	51.0	22.5	19.7
April 14	50.2	22.1	22.4
April 15	49.8	22.9	20.7
April 16	51.2	20.3	23.2
April 17	49.6	22.5	21.1
April 18	48.0	23.6	22.1
April 22	50.0	19.7	22.6
April 23	50.0	20.4	22.0
April 25	50.8	18.8	22.5

Average copper, 0.22 per cent.

tween 49,000 and 50,000 cu.ft. of free air per ton of charge; the altitude is 7800 ft. and the average barometric pressure about 23.5 in. of mercury. The hight of charge carried is 9 ft. above tuyeres; the speed of the furnace depends greatly on regularity in the hight of charge.

On April 26 I attached a revolution counter to the engine, in order to determine the exact air consumption, and found that the air used per ton of charge, exclusive of coke and slag, was 49,800 cu.ft. On this same day I reduced the coke to 8.1 per cent. per ton of charge, and the slag on the following morning seemed to run just as hot and the furnace made the same charges as on the day before. This reduces the fixed carbon to 6.96 per cent., with an average of 7.5 per cent. sulphur in the charge. The matte fall averages from 5.5 to 5.8 per cent., and the blast pressure between 32 and 34 oz. Having an uptake flue from the furnace to the chimney, the draft is so strong that we are able to leave the doors wide open. The top of the furnace is hardly warm and the feed floor, usually an unhealthy place on account of heat and smoke, is very agreeable. The charge is handled entirely by shovel. As mentioned above, the charge carried is always 9 ft. above the tuyeres. The tuyeres are all dark and no fire can be seen, indicating that the smelting focus lies above. The tuyeres are cleaned twice every shift; this seems to be absolutely necessary.

Water Used

Judging from the jacket water, the inside of the furnace against the jacket is pretty well crusted. I found that 100 gal. of water per min. were used. The temperature of the intake was 90 deg. F., and the outlet 104 deg. F., or a rise of 14 deg. At the Aguas calientes furnaces of the same size, the circulation is 150 gal. per min., the rise in temperature between intake and outlet being 30 deg. F. Without bosh, the consumption of water seems to be greater, as the Magistral furnace has a 1-ft. bosh and the Aguas calientes practically none. As to the respective merits of the two furnaces, there are none, excepting that the furnace with a bosh is apt to run cooler on top with a strong blast than the straight furnace; I am convinced that an overfire means waste of blast and coke.

I am now making a 30 per cent. matte, chiefly for the purpose of making as much matte as possible in order to be able to run a high silicious slag with the smallest amount of coke. The economical point depends on local conditions. By simply intensifying the blast, I find it possible to raise the grade of the matte as high as desired.

Comparison of Slags

The accompanying table shows an interesting comparison of the polybasic slag produced at Mansfeld, Germany, with the practically bibasic slag of the Magistral smelter. Through the courtesy of Anton Eilers, I have been able to secure the complete analysis of the slag from the Mansfeld plant.

COMPARISON OF MANSFELD AND MAGISTRAL SLAGS.

	Krughutte, Mansfeld.		Magistral, Mexico.	
	Per Cent.	Per Cent. Oxygen.	Per Cent.	Per Cent. Oxygen.
SiO_2	49.09	26.16	50.0	26.67
Al_2O_3	16.02	7.46	4.5	2.09
CaO	15.23	4.36	22.0	6.28
MgO	6.61	2.64	0.5	0.20
FeO	5.58	1.24	20.4	4.52
MnO	0.37	0.08	0.5	0.11
ZnO	1.76	0.35	1.0	0.20
K_2O	4.32	1.25	....	....
Na_2O	0.44	0.18	....	....

$$\frac{\text{Oxygen of Acids}}{\text{Oxygen of Bases}} = \frac{26.16}{17.56} = \frac{1.5}{1}$$ Mansfeld.

$$\frac{\text{Oxygen of Acids}}{\text{Oxygen of Bases}} = \frac{26.67}{13.40} = \frac{2}{1}$$ Magistral.

The Mansfeld slag corresponds to the formula, $3RO.2SiO_2$; the Magistral bisilicate slag corresponds to $RO.SiO_2$. I understand that the coke used at Mansfeld is in excess of 10 per cent. of the charge; at the Magistral smelter it is only 8.1 per cent. It goes without saying that the Magistral slag chills faster than an ordinary slag; this is plainly visible from the long hairs of slag, often 30 ft. in length, dragging behind the pots. The shells, however, are curiously often as thin as paper and never thicker than ½ inch.

Alumina in the Slag

The alumina present is most likely a monosilicate of alumina, $Al_4\ Si_3\ O_{12}$; the lime and iron are bisilicates, $Ca\ SiO_3$ and $Fe\ SiO_3$, respectively. I do not entertain the statement made by Mr. Shelby in the Journal of Aug. 8, 1908, that "alumina is neither a base nor a foreign substance carried in the slag menstruum, but is always present as an active acid;" on the contrary, I believe that alumina always behaves as a strong base and becomes more active through addition of silica and at times through lime and silica combined, most likely forming a double silicate of lime and alumina. A slag too high in lime can always be helped by the addition of an extra charge of silicious ore; I have found the same to be true with alumina.

In 1901 large quantities of gibbsite, aluminum oxyhydrate almost in the pure state containing copper sulphide, were treated at the Copper Queen, and I made many analyses and carefully studied slags as high as 32 per cent. in Al_2O_3. The ferric iron never exceeded 3 per cent. when the slag dropped below the monosilicate type; above this type no ferric iron appeared.

It seems that in all furnace work in the zone of slag formation, a bisilicate of iron and lime is formed, and the same enriched with FeO and CaO in descending the shaft of the furnace. If the furnace is run with an overfire, the smelting focus may be moved too high into the shaft and the slag may get chilled and cool down too much. But with a concentrated and well controlled smelting focus the bisilicate slag leaves the furnace very hot and is deceiving as to its silica content until a bar is put into the pot; this, on removal, shows long hairs of slag that may be drawn out 20 ft. in length. On cooling the slag shows no crystalline structure, excepting a fibrous form like asbestos. My anticipation that a highly silicious slag would prove hard on the settler has not been fulfilled; on the contrary, the settler after more than three weeks' run is as good as when put in.

Coming back to the draft, I believe that in modern smelting practice goosenecks and downtakes are unnecessarily employed to the great detriment of the furnace. If the gases become crowded above the furnace the fire will come up immediately, which means an unnecessary loss of coke and air. Air entering under high pressure into the furnace will cause strong and rapid driving, but will not necessarily produce flue dust (an idea entertained by some), while overfire, on account of the extended smelting focus, will reduce the pressure of the blast and naturally cause great loss of the same; also more coke will be required.

Consul-General John E. Jones reports that the work of constructing a model glass works at Winnipeg has begun. The organizers have been inspecting the plants in the United States to secure the best ideas. A tract of 480 acres of sand has been purchased, and glassware of all kinds will be made, with plate glass and table ware a specialty. These two classes of goods have been imported into Canada from Germany

The Rakowsky Automatic Unloading Ore Car

By L. S. Austin*

The cost of unloading an ordinary railroad gondola or flat car by shoveling out the load may be given at 6 to 7c. per ton, and hence the employment of bottom-dumping cars has been a great step in advance, decreasing the unloading cost to 1 to 2c. per ton for the labor. These cars work well where the ore is loose, lumpy, or capable of running freely from the car. When it is wet and sticky it is another matter, and in freezing weather it has been found necessary to set the car in a steam-heated shed or building where the ore, at least that adherent to the sides of the car, could be thawed out, though even then the ore may leave the car reluctantly. In summer the usual method with sticky ore, after dropping the bottom doors and loosening up the compact mass just above them, has been to poke down the contents with ¾-in. rods. Four men can poke down the contents of a 50-ton car in 15 minutes. The remainder is then scraped and swept out, and the doors are closed.

It has been sought to lessen the time of unloading by the use of an improved form of car which gives a larger bottom opening and a steeper slope so that it will more freely drop its load. Thus a certain car has a drop-bottom parting longitudinally, while another car has a bottom that slides on rollers. Either of these are opened or closed by hand, winding or unwinding a chain which in two to three minutes will complete the operation. The poking down must, however, be done as in the standard car, with the attendant danger that a man may lose his balance and be precipitated into the storage bin or pocket beneath.

The difficulties above enumerated are overcome in the Rakowsky car, which was invented and designed to handle Mesabi iron ore from the mines to the ore docks at Duluth and at Two Harbors, Minn. The car is well suited to any ores, but especially to those that are wet and sticky, and to wet concentrates.

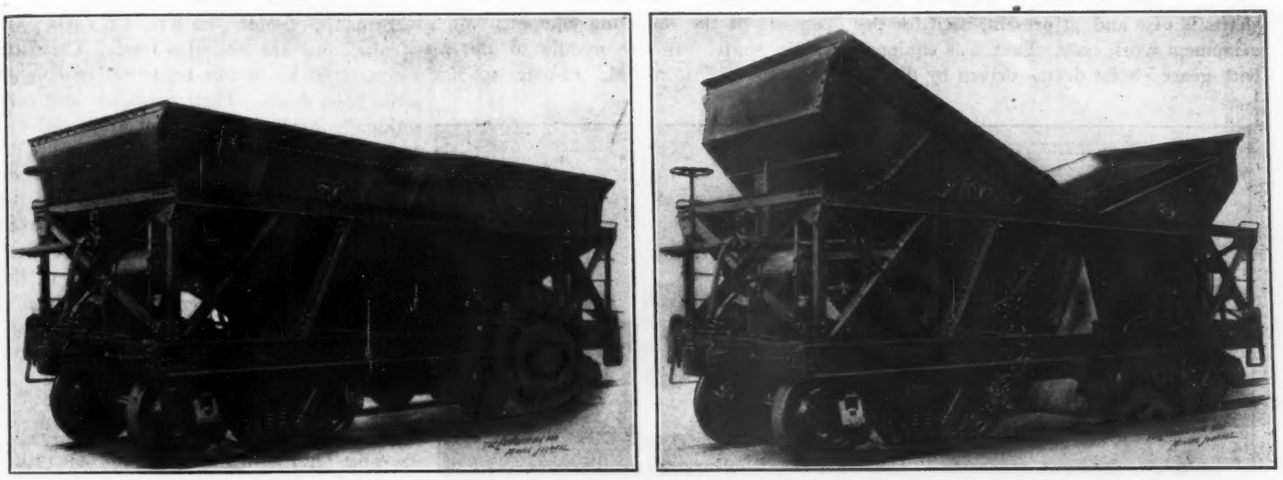
Fig. 1 is a view of the car closed and locked ready for loading; Fig. 2 represents the car with the two halves of the body, called buckets, wide open, the position assumed when the car is discharging its load. Each bucket is mounted on trunnions, supported by the top member of the main frame, and when closed the weight of each bucket is sustained at three points, the trunnions, the locked lip and at the rear.

To open the car there is a vertical air cylinder (shown in the illustration) at each end. At one movement of the piston the central lock is opened and the rear of the bucket quickly raised until it assumes a slope of 52½ deg., the halves at the same time gaping open 5 ft. to discharge the load freely. All trunnions are so set that the weight of the load assists in dumping and, when empty, the halves tend to close by their own weight. The buckets, bringing up with a jar against the axles of the trucks, dislodge the ore still adhering. If all is not removed the jar can be quickly repeated until the car is quite clean.

The compressed air needed for discharging is obtained from the engine, or it may be supplied from a pipe line at the pockets. In case compressed air is not available a hand-dumping attachment serves both to unlock and to dump the buckets, and this is the easier because the load assists in the movement. In case of an accident or for repairs the buckets may be taken off or replaced, and the main frame can then be easily got at for repairs.

I witnessed the unloading of this car at the Duluth ore docks of the Duluth, Missabe & Northern Railroad Company. The car worked smoothly; the time to unlock and open the car was 10 seconds, the load discharging in 25 seconds. The car was discharged and the ore was completely removed and the car locked ready for removing in 105 seconds. All the work of discharging can thus be done by a single operator, so that in case of a strike work will not be interrupted. The Rakowsky car has a capacity of 900 cu.ft., or about 100,000 lb. It is 22 ft. long and weighs 33,900 lb. The slope of dumping surfaces is 52½ deg.; center of gravity from rail, 6 ft.; pay load to total weight, 80 per cent. The rights to the use of the car are held by the Automatic Unloading Car Company, Duluth, Minn.

*Professor of metallurgy, Michigan College of Mines, Houghton, Mich.



THE RAKOWSKY AUTOMATIC DUMP CARS

Blau Gas

In the Journal of Feb. 27, 1909, under the title of "Blue Gas," by Robert Grimshaw, we published an article that has attracted a good deal of attention. It appears that Mr. Grimshaw made a mistake in the title of his article and the name of the gas that he described. The gas "Blau Gas" is named after its inventor, Hermann Blau (see U. S. Pat. 862,383). Mr. Grimshaw made the mistake of translating a proper name.

According to the U. S. Geological Survey, coal consumption in Alaska decreased in 1908, as compared with 1907, owing largely to the decreased industrial activities brought about by the financial depression, but in part to the increasing use of petroleum as fuel. At the Treadwell group of mines petroleum was substituted for coal, and there was also an increase of petroleum-burning engines on Yukon River boats. The shipments of petroleum to Alaska in the year ending June 30, 1907, amounted to 117,696 bbl.; they were 285,642 bbl. in the succeeding year.

Electric Hoisting Equipment at Winona, Mich.

Fly-wheel Motor Generator Set of Ilgner Type with Ward-Leonard Control; Maintenance and Repair Costs Reduced; Operation Successful

BY R. R. SEEBER*

The following description of the electric-hoist equipment installed at the Winona Copper Company's No. 4 shaft shows certain conditions under which electric hoisting was adopted to considerable advantage. The Winona Copper Company and the King Philip Copper Company are both working the Winona lode. The properties adjoin each other and are situated in the south end of Houghton county, Michigan. They are both under one management. Winona No. 4 shaft is 400 ft. north of the north boundary of King Philip property, and the King Philip No. 1 shaft is 1000 ft. south of that boundary. Each of these shafts is new and, at present, used for development work only. Each was equipped with geared hoist drums driven by duplex steam engines, the drum on the Winona hoist holding 1500 ft. of rope, and that at the King Philip 1200 feet.

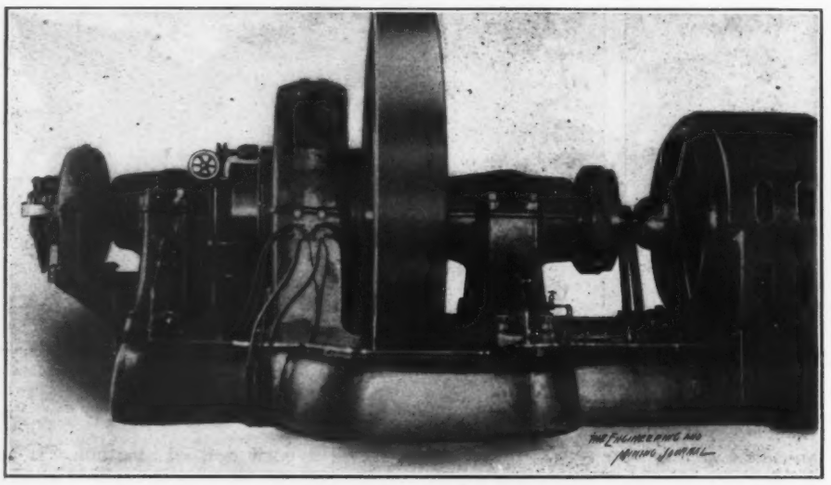


FIG. 1. HALF OF DOUBLE FLYWHEEL MOTOR GENERATOR SET

The No. 4 Winona hoist is about 500 ft. back of the railroad spur to the rock-house and about 25 ft. above it. Wood was burned under the boiler that supplied the hoist with steam, when the hoist was first started. No. 1 King Philip hoisting plant is within 100 ft. of the track and at about the track level. Coal was supplied to the boiler here by wheelbarrows from a pile alongside of the track. If the use of steam were to be continued for these plants after their production began, it would be necessary to provide facilities for coal storage and railroad trestles in each case. At the general power house, near No. 3 shaft, 1600 ft. north of No. 4, there was already installed a 250-kw., 60-cycle, 3-phase, 2300-volt alternator of Bullock make, driven by an Allis-Chalmers cross-compound condensing Corliss engine. This machine furnished light and power for both mines.

The Motor Generator Sets

For the operation of the above two hoists by electricity a flywheel-motor-generator set of the Ilgner type with Ward-Leonard control, built by the General Electric Company, of Schenectady, New York, was installed at the Winona No. 4 hoist house. The motor-generator set consists of the following equipment on a single shaft: In the middle of the set is a type "I," form "M," 12-pole, 450-h.p., 600-r.p.m., 2080-volt, 3-phase, 60-cycle, variable-speed induction motor, connected on either side by flexible couplings to a 20-ton flywheel 10 ft. in diameter, and a M.P.C.-6, 170-kw., 575-volt, interpole direct-current generator.

A separate exciter for each generator, delivering current at 125 volts, is placed on each end of the shaft. Fig. 1 shows half of the motor-generator set. The four main bearings supporting the flywheels and the direct-current generators are supplied with oil by two sets of pumps, belt driven from the shaft. These pumps are placed under the shaft on the main casting at either side of the induction motor. The oil used is Ajax engine oil, which is stored in a tank in the main casting, from which the pumps take it and force it to the bearings. The oil enters the side of the bearings a little below the center line, so the revolving shaft carries the oil underneath. The oil returns to the tank by gravity. A water coil for cooling the oil is placed in the tank, but its use has not been found necessary. About three hours are required for the set to come to rest after the power is shut off. One generator furnishes current to operate the hoist in the same building at No. 4 Winona, while the other furnishes current for a motor at King Philip No. 1, a distance of 1400 feet.

The Hoist Motors

These hoist motors are type C.L.C., form "B," 6-pole, 200 h.p., 430 r.p.m., 550 volts, and are shunt wound. They are connected by double-reduction gearing to the hoist drum. Their fields are kept continually excited by current from the exciter on the motor-generator set. This current is kept at a pressure of 125 volts by Tirrell regulators. The current in the hoist motors is varied and reversed through controllers of the usual street-car type. The controllers are placed in the field circuit of the generators. The first point on the controller operates a contactor closing the main circuit from the generator to the motor.

Automatic-regulating Water Rheostat

The alternating current for operating the motor generator passes through a regulator, which automatically varies the resistance in the rotor of the motor, in proportion to the demand of the motor for current. Fig. 2 shows sectional views of the automatic-regulating water rheostat, the operation of which is as follows: The leads *A* are connected to the slip rings of the induction motor of the motor-generator set, the variable resistance in the armature circuit of the induction motor is that due to the column of salt water in the pipe below the plate *C*; the plates *C* of the various phases are short-circuited at the top by the bar *D*. The induction motor (regulating motor) operating the rheostat is connected in series with the primary of the main induction motor. The weight of the moving parts in the rheostat is balanced by the torque due to the regulating motor which acts in the direction shown by the arrow, and the counterbalancing weight *B* so adjusted that it together with the torque of the motor just balance the weights of the moving parts in the rheostat, when the line current is at its normal value. Increasing the counterbalancing weight

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tends to lower the current required to operate the rheostat; that is, to further limit the current taken by the main induction motor and *vice versa*.

Now assume the counterweight adjusted for 50 amp. As the load comes on the direct-current generator, the current taken by the main induction motor increases. When this current exceeds 50 amp., the torque of the regulating motor plus that of the counterweight raises the plate *C*, introducing resistance in the main induction-motor armature causing it to slip and allowing the flywheel to take the peak. The introduction of the resistance in the main induction-motor armature reduces the current to 50 amp., making a new balance. As the load continues to increase on the generator, the regulating motor continues to increase the armature resistance. As the load drops off, the reverse action takes place.

The handwheel at the left is for use in starting up the motor-generator set. The plates are raised by this handwheel a considerable distance. After the motor has started, the handwheel may be turned down rapidly, the regulating motor preventing the dropping of the plates faster than that corresponding to full-load current on the motor. The input of alternating current to the induction motor is thus automatically regulated and limited as determined by the setting of the regulator.

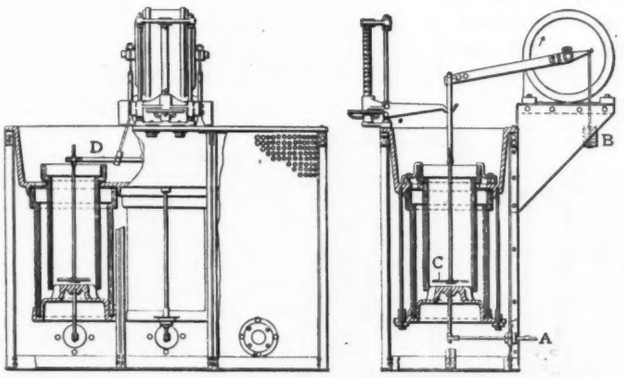


FIG. 2. SECTIONS OF WATER RHEOSTAT

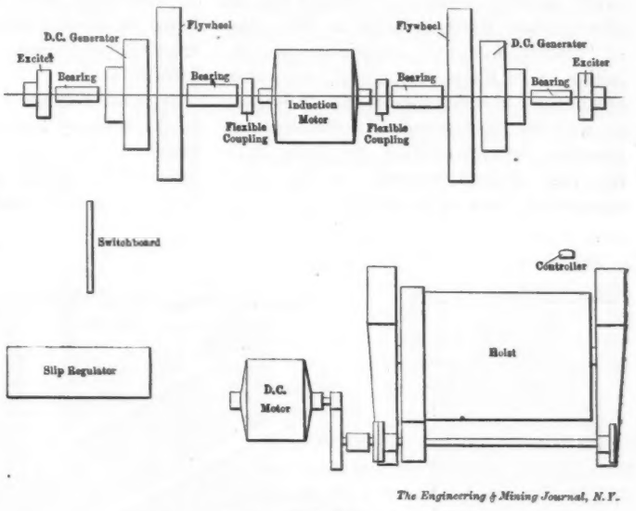


FIG. 3. PLANS OF GENERATOR SET AND HOIST

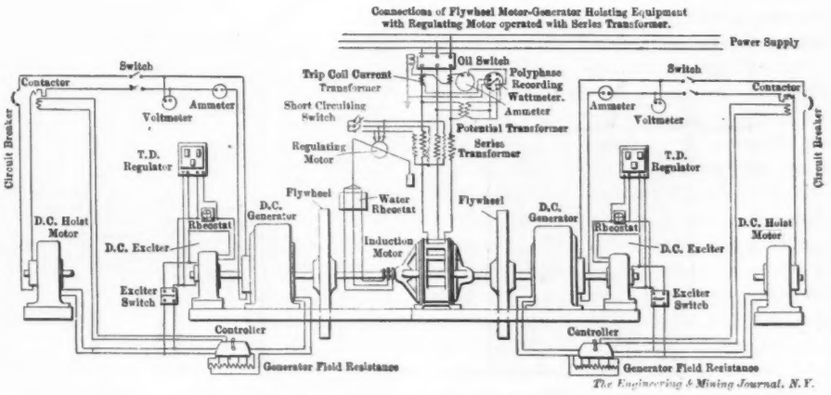


FIG. 4. CONNECTIONS OF HOISTING EQUIPMENT

Economics of the New Equipment

Each of the hoists described serves a shaft inclined 70 deg. from the horizontal. The skip weighs 1¼ tons empty and holds 2½ tons of rock. The hoist rope is 1⅛ in. in diameter. At Winona No. 4 shaft there are two skips working in balance; at King Philip No. 1, the skip is unbalanced. To start the skip, especially the unbalanced one, a large amount of power, sometimes 300 h.p., is necessary. This is supplied by the slowing down of the motor-generator set, the flywheels giving up their stored energy.

The rate of alternating-current input to this set, as shown by the ammeter on the switchboard, remains fairly constant, except when both hoists come in at once. When an unbalanced skip is descending the hoist motor is used as a brake, generating current and helping build up the speed of the set when it is below normal. Aside from the improvement in the handling of the skips in the shaft, this method of hoisting makes it possible to use a smaller and more efficient engine operated continuously under fairly uniform load.

The saving obtained by generating all the power in one plant is the principal saving in this case. With each of the plants using steam, four additional firemen would be necessary. In their place two boys, to attend to the motor-generator set, have been added.

Each plant, if using steam, would burn about 70 tons coal per month under present conditions, or together 140 tons. The additional coal burned by the No. 3 plant on account of the electric hoist is only 50 tons, showing a fuel saving of 90 tons per month. The maintenance and repair of two boilers are also saved. Having removed the reciprocating parts that operated the winding drums, the maintenance on the hoist becomes almost nothing.

At the main power plant there was already in existence a coal station and the necessary rail connections. If steam were continued as a motive power for these two hoists, it would be necessary to construct two new coal trestles, which construction expense would largely offset the construction expense on account of the electric hoist. The electric hoist has been in operation since Sept. 15, 1908, and has given entire satisfaction.

Statistics of The Mineral Industry show that less flint was quarried in the United States in 1908 than in 1907 by 11,341 short tons ($99,699). The 1908 production was 64,220 short tons, worth $318,000.

The Pennsylvania railroad specifications on galvanized iron for car roofing call for 4 oz. of zinc per square foot of material, this amount of coating being required on both sides of the sheets.

Shortening the Roasting Period for Mercury Ores

Roasting Period at Blackbutte, Oregon, Reduced from 24 to 4 Hours. Flat Temperature Slope Overcome in the Dennis Roasting Furnace

BY WILLIAM B. DENNIS*

The primary operation in every fire treatment of ore is the transfer of heat from the gas body to the ore body. The laws of heat translation are known to every academy student of physics but the phenomenon itself belongs to that class of "matter-of-course" experiences too familiar to be likely to suggest or awaken any interest in rudimental study. It is even so with the metallurgical profession and practice, notwithstanding the daily dealing with thermo-dynamics as the chief elementary basis of its work.

The effort to evolve from a pound of coal the highest thermal duty cannot be criticised. If our present effective value of fuel were to be utilized at higher efficiency in the final duty of heating, possibly equal or greater economy may be secured than the perfection of fuel combustion can afford.

In what follows I have called attention to the primary laws underlying the translation of heat and have endeavored to show their simple and practical application to furnace practice as developed by

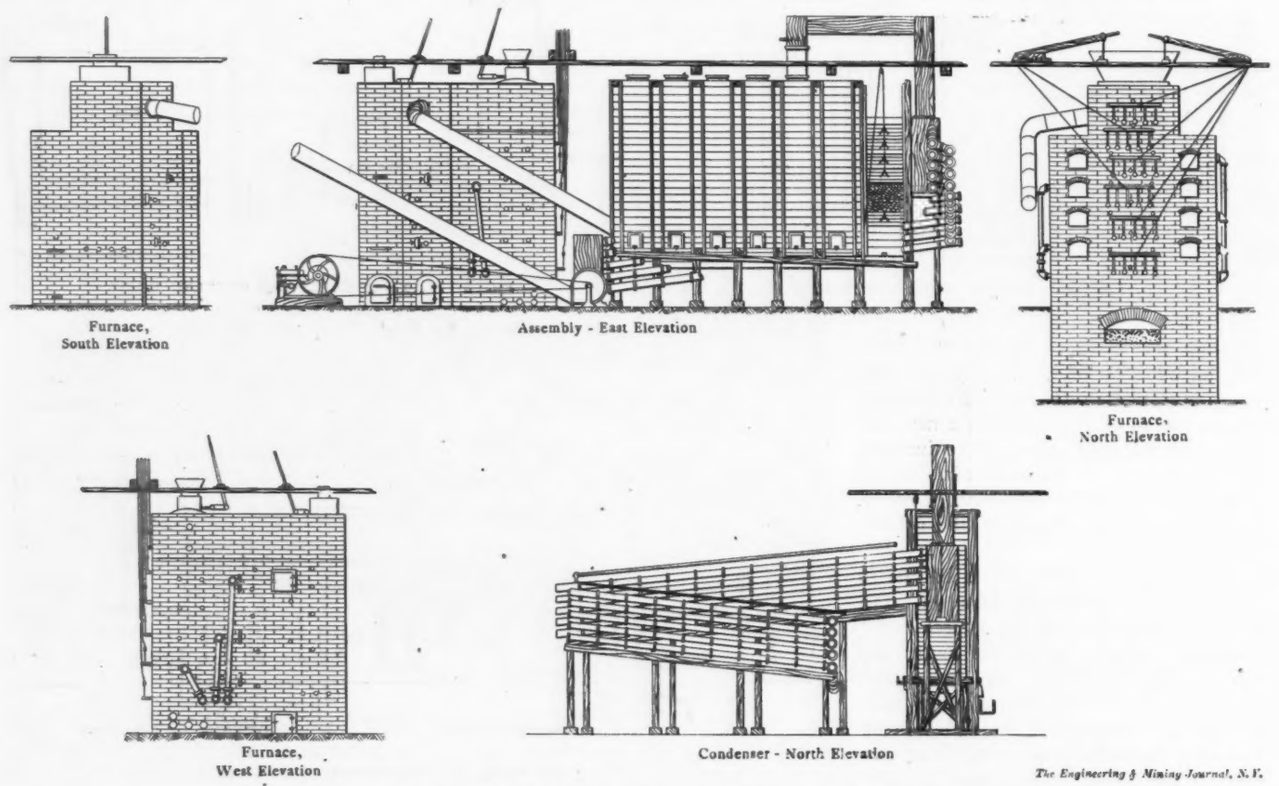

Furnace, South Elevation
Assembly - East Elevation
Furnace, North Elevation
Furnace, West Elevation
Condenser - North Elevation
The Engineering & Mining Journal, N. Y.

FIG. I. ASSEMBLY OF TESTING PLANT FOR ROASTING MERCURY ORE AT BLACKBUTTE, OREGON

furnace of given dimensions, the reduction of the 24- to 36-hour period was the first step sought. This naturally led to the study of first principles as regards the primary laws of heat flow and absorption.

Heat Transference

In the science of heat, the phenomenon of transference naturally divides under two headings, the laws of flow from the heat source and the laws of absorption by the heat-receiving body. It is with the latter division that we are concerned here, and chiefly with the rate of absorption. At normal atmospheric pressure, the flow at given temperatures is constant and practically instantaneous in operation, but the rate of absorption is governed by the nature of the receiving body and its continuously changing conditions and state during the operation. Allowing for the latent period at maximum temperature required to complete the "cooking," the rate of absorption determines the capacity of the furnace, or the number of tons that can be put through in a given time.

Two general laws govern the rate of the absorption of heat. These may be stated

To suggest the value of a review of our early studies of the primary laws of heat flow and absorption, in connection with our thermo-metallurgical furnaces, is apt to smack of the academic, and especially to aver that such study must lead to conclusions justifying radical changes in standard designs of furnace construction. Confronted with increasing cost and decreasing supply of fuel, every promise or proposal of an eight to ten per cent. fuel saving is seized with avidity by the man or the company that pays the bills.

our work and experiments at Blackbutte, Ore. This work included the problem of treating a large mass of low-grade mercury sulphide ore. The treatment cost by the old method was reasonably low, but, besides other difficulties, the outlay of capital for furnaces of sufficient capacity to treat the necessarily large tonnage was almost prohibitive.

The usual roasting period for this class of ore is 24 to 36 hours. The theoretical temperature is 680 deg. F., but in practice it is actually from 1000 to 1200 deg. As the length of time required for the operation is the measure of capacity of a

*General manager, Black Butte Quicksilver Company, Black Butte, Ore.

as follows: (1) The law based on the angle of temperature slope between the heat source and the receiving body, namely, the more acute the vertical angle, or in other words the steeper the slope, the more rapid will be the absorption. (2) The law based on the variations in the specific heat of substances due to temperature, namely, that the capacity for heat rises and falls in proportion to the rise and fall of temperature. It will be observed that with both laws the temperature of the receiving body (ore) is the controlling factor in the rate of absorption. And yet in our metallurgical furnaces the temperature of the ore and its relation to the temperature of the hot fuel gases have seldom if ever been taken into account.

The first law above referred to, which for convenience we will call the law of temperature slope, needs no demonstration to the readers of the JOURNAL. But for the purpose of fixing our minds upon its adaptation to the metallurgical furnace, a simple experiment may be appropriately referred to. Insert a mercury thermometer at ordinary temperature into a vessel containing hot water. It will be observed that the mercury column rises quite rapidly at first, but gradually slackens speed as the mercury and water approach equilibrium, and that the last few degrees of rise will be attained very slowly. This is illustrated by Fig. 2. In this diagram the water is assumed at a constant temperature of 210 deg. F. It will be observed how the lines representing the temperature slope grow gradually flatter as equilibrium is approached, and since the speed of absorption is in exact ratio to the angle of temperature slope, the same lines may be taken to represent the rate of heat transmission, as indicated on the shorter scale of the diagram.

LAW OF TEMPERATURE SLOPE

The so-called law of temperature slope may, therefore, be stated thus. In an atmosphere of constant temperature and pressure, the rate of speed at which heat will be absorbed by a substance at lower temperature, moves in inverse ratio to the quantity of heat absorbed when measured on a temperature scale.

In the light of this law, let us examine our metallurgical furnaces. In spite of the great variety of types in use, the primary operation of ore heating is substantially the same in all. The fuel gas at maximum temperature is introduced at one end of the ore receptacle and comes in contact with the ore zone of maximum temperature, or at that point where the temperature slope line between fuel gas and ore is the flattest obtainable within the limits of the operation. As the hot gas and ore move in opposite directions their respective temperatures move in inverse ratio to each other. The ore becomes hotter and the gas proportionately cooler, so that at each and every unit of contact from beginning to end of the operation a relatively flat temperature slope is maintained, and, therefore, the process of heating is permanently established at the slowest possible rate of speed. In fact if slowness of heating were desired it could not be better designed.

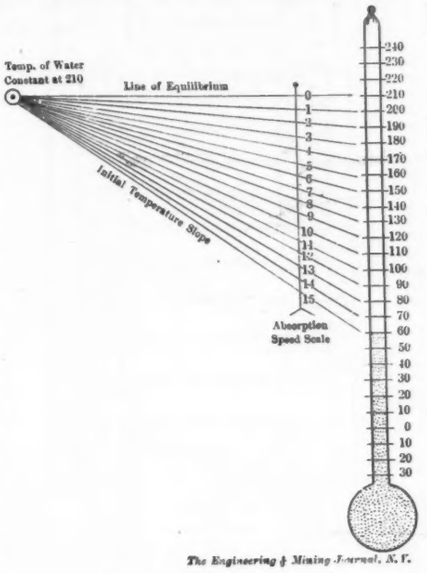

Temp. of Water Constant at 210
Line of Equilibrium
Initial Temperature Slope
Absorption Speed Scale
The Engineering & Mining Journal, N. Y.

FIG. 2. HEAT ABSORPTION

Diagram illustrating the absorption of heat in a continuous operation of heating where the heat supply remains at constant pressure and temperature, showing the gradually reducing angles of temperature slopes moving from the initial slope to equilibrium; and demonstrating the law that with constant pressure and temperature the speed of heat absorption moves in inverse ratio to the quantity of heat absorbed. See absorption speed scale on diagram.

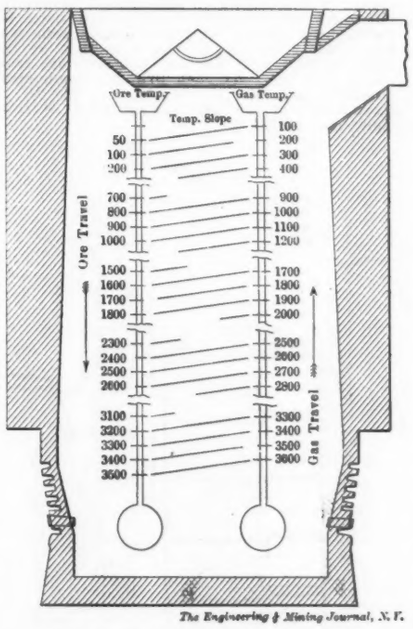


FIG. 3. FLAT TEMPERATURE SLOPE

Diagram illustrating the flat temperature slopes between heat-current and ore in the common type of shaft furnace, where the ascending gradually cooling gas comes into contact with the descending gradually heating ore.

The diagram, Fig. 3, illustrates the principle in the operation of a shaft furnace. The temperature figures used are assumed for convenience. The same conditions prevail in the horizontal furnace of the rotary type, and in all furnaces where the ore and heat currents move in opposite directions without gas recuperation. In furnaces of the reverberatory type, and in intermittent furnaces, where the ore is subjected from the beginning to the fuel gases at maximum temperature, we have the exact conditions of the thermometer illustrated in Fig. 2. At the beginning of the operation, the temperature slope between heat current and ore is at maximum steepness, but gradually slackens as the temperature of the ore rises and equilibrium is approached.

The reverberatory roasting furnace has greater per diem capacity than the shaft furnace of equal area because of the steep temperature slope in the early part of the operation, but in the latter part it is seriously retarded by the reduced incline. From the foregoing it would seem clear that in the science of heat translation as applied to metallurgy, an important relation exists between the temperature of the ore and the temperature of the supplied heat current at each corresponding unit of the ore-heating operation.

CHANGE IN SPECIFIC HEAT

We come now to consider the relation of temperature to specific heat in connection with the operation of ore heating. According to the second law above referred to, the capacity of a substance to absorb heat varies in ratio to the temperature of determination. Not until recently has laboratory experimentation furnished us any definite data concerning the variations in the specific heat of the unit, water, at different temperatures, but it has long been recognized by students of physics that measurable variations occur with many known minerals and metals.

Changes in the specific heat of the same substance arise from two causes, change of temperature and change of state or condition. And since in every ore-heating operation both temperature and condition are in continuous change, it remains only to be determined whether, in actual practice, the range of change is sufficient to appreciably effect furnace operation on a commercial scale. The experiments of Griffiths, Naccari, Tilden and others, show that for most solids the specific heat decreases or rises as the temperature of determination decreases or rises; and within given ranges of temperature the rise and fall in each substance is uniform as to itself. Or in other words, as the temperature of the substance under treatment rises and falls, its capacity for heat rises and falls ratably.

It follows, therefore, that as the ore gets hotter, proportional increased volume of initial heat should be supplied, and failure to do this in furnace practice will result in retarding the progress of the ore-heating operation, or in other words, in-

crease the time required to complete the roasting; and *vice versa*, that if the volume of heat supplied is in excess of the capacity of the ore at given temperatures to absorb, corresponding waste of heat will follow.

Relation of Ore Temperature to Heat Volume

That an important relation exists between ore temperature and volume of supplied heat, as well as between ore temperature and fuel gas temperature, appears certain. Just how important this relationship may be in practical furnace work may be anticipated to some degree by the study of H. F. Weber's determinations of the changes in the specific heat of crystallized silicon. Weber's experiments covered a temperature range of —50 deg. to 200 deg. C., and results are given as follows: Specific heat 0.13 at —50 deg.; 0.16 at zero; 0.18 at 50 deg.; 0.195 at 100 deg.; 0.202 at 200 degrees.

Since silicon dioxide is the chief element with which the metallurgical furnace usually has to deal, it is unfortunate that Weber's experiments were not continued to higher ranges of temperature. Failure to do so was due, no doubt, to the great difficulties of accurate calorimetry at high temperatures. Indeed it is doubtful, for the same reason, whether the result given for even 200 C. can be relied upon. Nevertheless the results furnished are sufficient to show the remarkable degree of change. And while the rate of change is shown to be greater at the lower temperatures, and while there may be even a limiting point at some higher temperature, it is more likely that the apparent greatly reduced rate of increase on the ascending temperature scale is partly, if not largely, due to the difficulties of determination mentioned.

Unfortunately no definite data are available upon which may be based mathematical calculations of practical value concerning the amount of increase in heat volume required to meet the conditions of change in specific heats of various substances corresponding to temperature rise. In practice it can be determined only by experimentation in each individual case, which is possible only when proper means have been provided for control of the heat supply. Hoadley[1] gives the specific heat of wrought iron over the range of 32 deg. to 200 deg. F. at 0.1129, and 32 deg. to 2000 deg. at 0.2619, showing the wide range of change. Another authority states that the specific heat of platinum from 32 deg. to 446 deg. F. increases 0.000305 for each 100 deg. temperature rise. Other individual examples are given, but the problem has not been reduced to a definite equation.

Effect of Change of State

Changes in specific heat of the same substance due to change of state or condition, are even more marked in some substances than those due to temperature. Examples of these changes in specific heat are: Ice, 0.5; water, 1; steam, 0.34 (constant pressure); solid lead, 0.0314; molten lead, 0.0402; cast iron; 0.1298; wrought iron, 0.1138. According to Kopp's law the molecular heat of a solid compound is the sum of the atomic heats of the constituents. A body of ore in process of heating is undergoing continuous structural and constituent change, due to evolution, absorption, expansion, and finally fusion. The change begins at comparatively low temperatures according to the nature of the ore, and by the time the crucible is reached, radical chemical and mechanical metamorphoses have taken place, the degree depending upon the nature of the ore and of the process. The changes of state and condition effected in the metallurgical furnace are, for the most part, in the same direction as the changes due to temperature, namely, toward increase in specific heat, demanding further increase of thermal supply as the heating process progresses.

A full discussion of our subject should include also the relation of temperature to kinetic energy as affecting the velocity of heat translation, but the two relations of ore temperature already discussed are sufficient to draw attention to the value of the ore-temperature factor in the heating operation. It has been shown that the temperature of the ore in relation to the temperature and volume of the supplied heat current determines the velocity of the absorption of heat by the ore according to the laws of temperature slope and change of specific heat. It would, therefore, follow that to secure high efficiency of the furnace would require proportional regulation of ore temperature to heat temperature and volume, at each unit, or step, in the ore-heating operation. A brief description of what has been done in this direction by the writer, experimentally and in actual practice, follows.

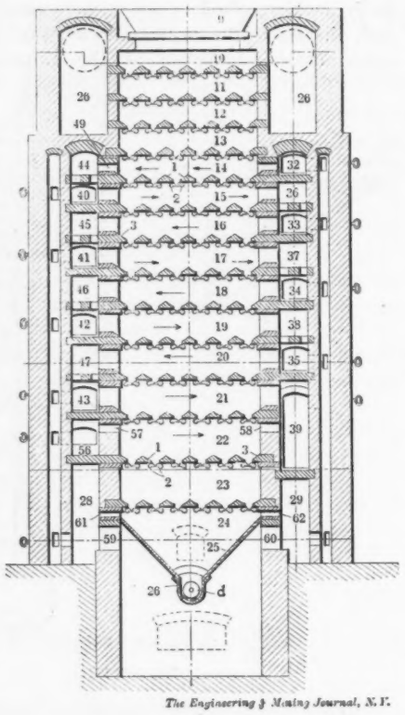


FIG. 4. DENNIS ROASTING FURNACE

Vertical section through ore tower of experimental furnace erected at Blackbutte mine, Lane county, Ore., for testing the Dennis roasting process, showing the division of the ore tower into zones and the arrangement of primary and secondary combustion chambers whereby the temperature slope between heat current and ore in each zone was regulated, resulting in the reduction of the roasting period of mercury sulphide ore from 24 to 4 hours. At each primary combustion chamber (32, 40, 33, 41, 34, 42, 35, 43) a fresh supply of fuel gas was admitted. Arrows show gas travel.

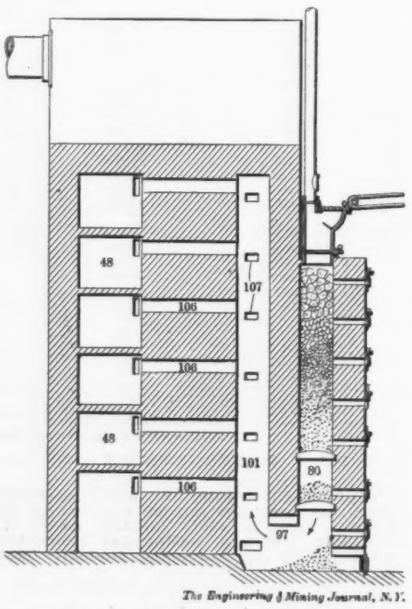


FIG. 5. WOOD-GAS PRODUCER

Showing the wood-gas producer connected with the furnace as an integral part of the structure. Zone No. 80 is the reducing zone.

The Problem at Blackbutte

The ore under treatment was mercury sulphide with a gangue of dolomite, silicified andesite and volcanic ash rock, carrying 53 to 58 per cent. silica, and some free sulphur, pyrite, marcasite and quartz limonite. Its total content of sulphur, combined and free, was from 8 to 12 per cent. The only available fuel was wood—Oregon fir and hemlock. A Scott-Hutner furnace of the usual California type erected on the property at a cost approximately of $40,000, treated at best 36 tons per 24-hour day. The ore was 36 hours passing from the feed hopper to the discharge ports. It was estimated that the ore reserves of the mine could furnish from 350 to 400 tons per day. This output would require about 10 Scott-Hutner

[1] *Trans.*, A. I. M. E., Vol. VI, p. 718.

furnaces costing in the neighborhood of, say $300,000 to $400,000.

This was at least frightening if not prohibitive, and a remedy was sought. The reduction of the 36-hour roasting period would result in a corresponding reduction in the number of furnaces required, as well as operating expenses. With this aim, among other considerations, experiments were undertaken.

It early became evident that to secure the regulation of temperature slopes and heat volumes above described, some form of gas firing, as distinguished from direct firing, would be required. The extreme resinous character and other peculiarities of our Oregon fir wood prevented the use of any of the gas producers now on the market, even those claiming to have solved the problem of wood gasification. Therefore, a simple form of gas producer, Fig. 5, was designed, constructed of ordinary brick and made an integral part of the furnace. Intervening the producer and the furnace was a brick chamber which operated as a gas holder, and from which the hot gas was drawn off and conducted under control to various parts of the furnace as wanted. There were no scrubbers, the sensible heat of the gas being conserved. Artificial-suction, down draft was employed, the fan being located at nearly the extreme end of a series of mercury condensers following the furnace.

Passing over other special features of the producer, it may be well here to mention only the reducing zone formed by the space allowed between two sets of grate bars, as shown in the diagram. This zone, in operation, becomes automatically filled with live coals that drop through the first set of bars. The fuel gases are drawn through the bed of live coals, thus formed in this zone, resulting in the well known chemical reaction $CO_2 + C = 2CO$. In this constituency the gas is maintained during its further passages, until it reaches the particular ore zone of the furnace where it is to be utilized. Just before entering the zone it passes through an antecedent combustion chamber, where it is mixed with the requisite supply of heated air and burned again to carbon dioxide. A separate antecedent combustion chamber is provided for each zone of the furnace. By this means the temperature and heat volume of each zone of the furnace is at all times under control, therefore admitting of that regulation of temperature slope, etc., previously described.

Attaining a Steep Temperature Slope

It has been shown that the steeper the temperature slope between ore and heat current the more rapid will be the absorption of heat by the ore. The maximum slope would be represented by a line drawn between the initial or minimum ore temperature and the maximum fuel-gas temperature. But, since the maximum gas temperature is a fixed quantity, and the ore temperature is continuously rising during the heating operation, it is evident that the maximum cannot be maintained. Having first determined the duration of the latent period of the "cooking" process for the particular ore under treatment, as hereafter explained, it next becomes necessary to ascertain the mean temperature slope and the number of units of the ore body to which the mean slope must be applied in order to heat the ore to the maximum temperature within the same time, as nearly as may be, as that of the latest period. Division of the ore-body into corresponding units is necessary.

In roasting processes it is practicable to make this division actual, while in smelting the ore column may be maintained in its integrity and the segmentation into zones defined by the arrangement of the gas inlets. Thus the heating operation, though still remaining continuous and gradual, proceeds in well defined steps, the mean temperature slope being maintained uniformly for all the steps. Fig. 4

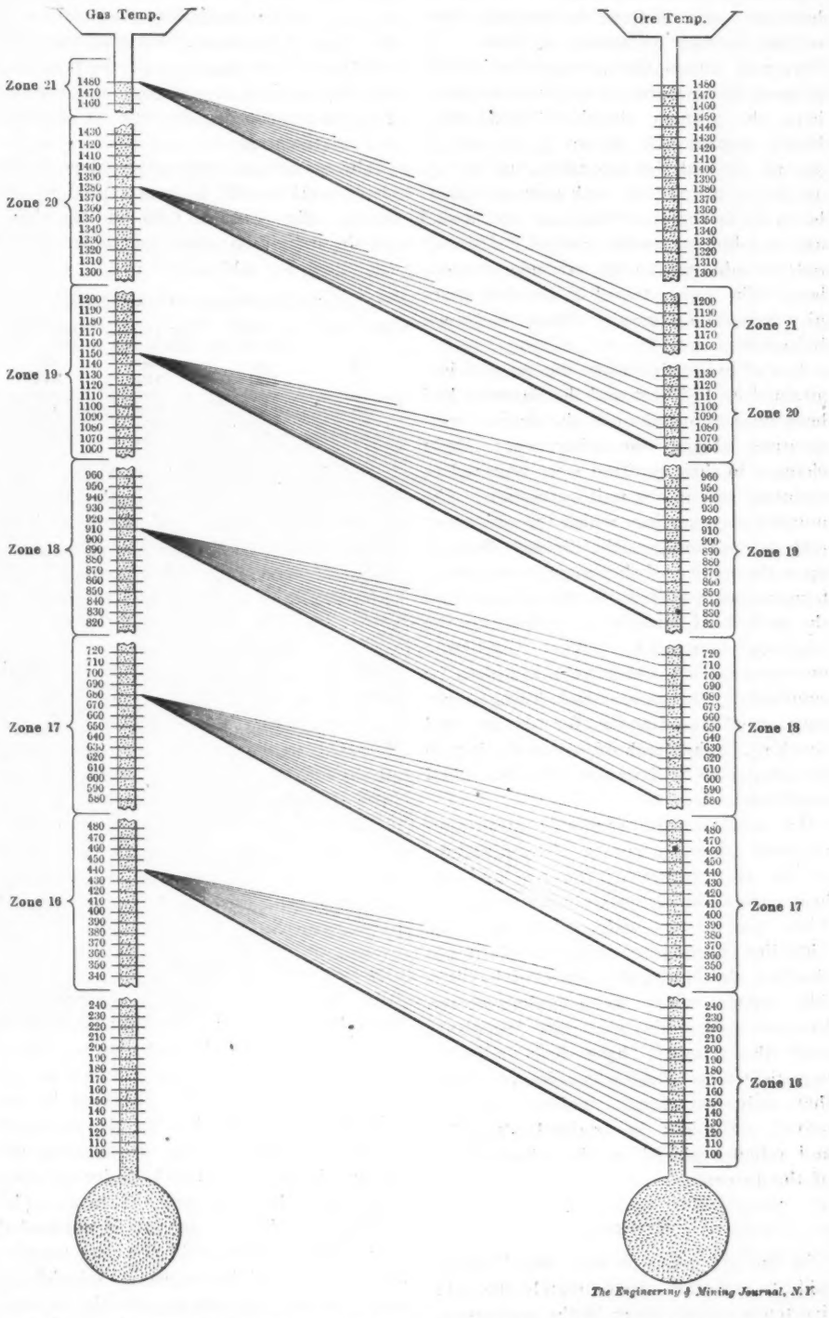


FIG. 6. TEMPERATURE SLOPES WITH DENNIS ROASTING PROCESS

Diagram of the approximate temperature slopes maintained in actual practice between ore and heat current in an ore column divided into six zones. See Fig. 4. Heavy lines indicate the primary slopes; light lines, intermediate slopes. Note uniformity in all zones.

is a vertical section through the ore tower of the furnace that was constructed and operated for these tests.

Fig. 1 shows the complete assembly of the plant. As will be seen the ore tower is divided by means of a combination of V-tiles and dumping gratebars into a series of superimposed zones. The gratebars are operated from the charging floor of the furnace by means of levers. In Fig. 4 is shown the arrangement of the primary and secondary combustion chambers, the primary chambers being numbered, respectively, 32, 40, 33, 41, 34, 42, 35, 43, 56, and the secondary, 44, 36, 45, 37, 46, 38, 47, 39. At each primary chamber a fresh supply of fuel gas and heated air is admitted under control. Hot air only is admitted to the secondary chambers. The zigzag travel of the fuel gases in a general downward course, is shown by arrows.

It was found that after the furnace had attained its full heat and the dampers had been once adjusted to fit the desired temperature slopes, thereafter very slight changes in their position were required to maintain continuous uniform action. The number of zones into which the ore tower may be advantageously divided depends upon the nature of the ore, the maximum temperature required for the process, and the period of latency in completing the "cooking" operation. With Blackbutte mercury ore six zones were found to be sufficient. The upper and lower zones were used respectively for drying and "cooking." The depth of ore on the hearth is a matter to be determined by individual conditions.

To ascertain the economic mean-temperature slope, accurate determinations of the temperature of the ore and the heat current in each zone were necessary. This was done with a Heræus Le Chatelier pyrometer using a platinum-rhodium thermocouple connected by flexible copper wires to a galvanometer. Frequent determinations are necessary until the dampers have been adjusted to satisfactory working conditions. After that only occasional readings are required, or might be omitted altogether and reliance placed on the educated eye of the foreman.

Results

In the six zones it was found practicable to maintain approximately the relative temperatures given in the accompanying table.

ZONE TEMPERATURES.

Zone No.	Constant Gas Temp. Deg. F.	Primary Ore Temp. Deg. F.
16	440	100
17	680	340
18	910	580
19	1150	820
20	1380	1060
21	1480	1160

The "primary ore temperatures" are the temperatures of the ore when dropped into the zone represented, this temperature having been induced in the previous zone. The zone numbers have reference to Fig. 4. Referring to same diagram, zones 10, 11, 12, 13, 14, 15, are drying zones, and 22, 23, cooling zones.

The temperature slopes of the above are shown in Fig. 6. It will be observed that the step from zone 20 to 21 is not so great as the preceding steps, although the slope is the same. Zone 21 was used substantially to take care of the period of latency required to complete the cooking process, as 1060 deg. in zone 20, is ample for volatilization.

The maximum temperature slope in the above work would be represented by the figures 1480 — 100 = 1380, and the slopes for the individual zones are shown in the accompanying table.

SLOPE OF INDIVIDUAL ZONES.

Zone No.	Gas Temp. Deg. F.	Ore Temp. Deg. F.	Temp. Slope Deg. F.
16	440	100	340
17	680	340	340
18	910	580	330
19	1150	820	330
20	1380	1060	320
21	1480	1160	320

It will be observed that the slopes range from 340 to 320, reducing in the direction of the hotter zones, and that the depth of the zones, Fig. 4, gradually increases in the same direction. This is due, as already explained, to increased speed of absorption and larger heat volume required at higher temperatures.

During the writer's experiments, which included the operation of the plant for nearly a year, many combinations of classified ores were tried, ranging from all fines to 6-in. diameter. The best results were obtained from the ore just as it came from a Gates gyratory crusher, breaking to egg size and carrying about 33 per cent. fines passing a four-mesh screen, of which 15 to 18 per cent. would pass 20 mesh.

Practical Benefits

In the usual method of heating ore, with the ore and heat current moving in opposite directions through the ore receptacle, the amount of time required to finish the roast is virtually governed by the amount of time it takes for the first unit of the ore; that is, the ore nearest the feeding hopper, to absorb under existing conditions the first unit of heat. The existing conditions are minimum-cooled gases and minimum-cold ore—flat temperature slope and low capacity of absorption. In a continuous process the attempt to move the ore any faster, that is, before the first ore unit has absorbed its due proportional first heat unit, would result in soon cooling down the furnace. Any process of heating based upon such an arrangement is manifestly unscientific and not economic. It is the wrong end of the furnace to exercise the control. The time required at the finishing end, where the "cooking" is finally completed, should set the time pace for the whole process.

In every thermo-metallurgical process there is a period of latency during which the maximum temperature remains constant. The duration of this period is the true scientific measure of the time necessary for the whole operation. The preceding steps of the heating—from normal temperature to maximum—should be conducted approximately in the same period of time, unless special reasons exist for slow heating. If this is practicable any other course is manifestly a flagrant waste of time in our metallurgical practice.

Let us suppose the latent period for an ore at, say 1200 deg. F., to be one hour. To require 24 hours for the preliminary operation of inducting into the ore the 1200 deg. of heat appears ridiculous. Fuel economy ceases to be a factor in face of such a condition. Time is the paramount factor in economy. The operating payroll figured against fuel coal leaves a wide margin in favor of time. But it must not be assumed from this remark that the consumption of fuel is increased by the process described. On the contrary, the per ton consumption is greatly reduced.

The practicability of the divided-zone method of heating by the regulation of temperature slopes between heat current and ore, as far as developed by the writer's experiments to date, has been shown by the reduction of the roasting period of mercury sulphide ore from 24 and 36 hours to four hours, with a cleaner and in every way more satisfactory roast. It would seem that the results of these experiments were sufficiently definite and encouraging to suggest other and greater possibilities along the same lines, which it is hoped others may realize and assist in developing.

Thyssen & Co., of Muelheim-Ruhr, who have acquired the patent rights of the Gayley dry-air blast for Germany and some other European countries, are building a plant for the Deutscher Kaiser Company, at Bruckhausen, for one furnace of 500 tons daily capacity. An extension for three additional furnaces is provided for.

The production of calcium in the United States in 1908, as shown by statistics collected for The Mineral Industry, was 350 lb., valued at $525. The first metallic calcium was produced in this country in 1907 when 350 lb., valued at $613, were marketed.

Deposits of iron ore in Lower California are said to be extensive and of high grade, assaying up to 64 per cent. iron. One of these, near San Quentin, is within a short distance of deep water.

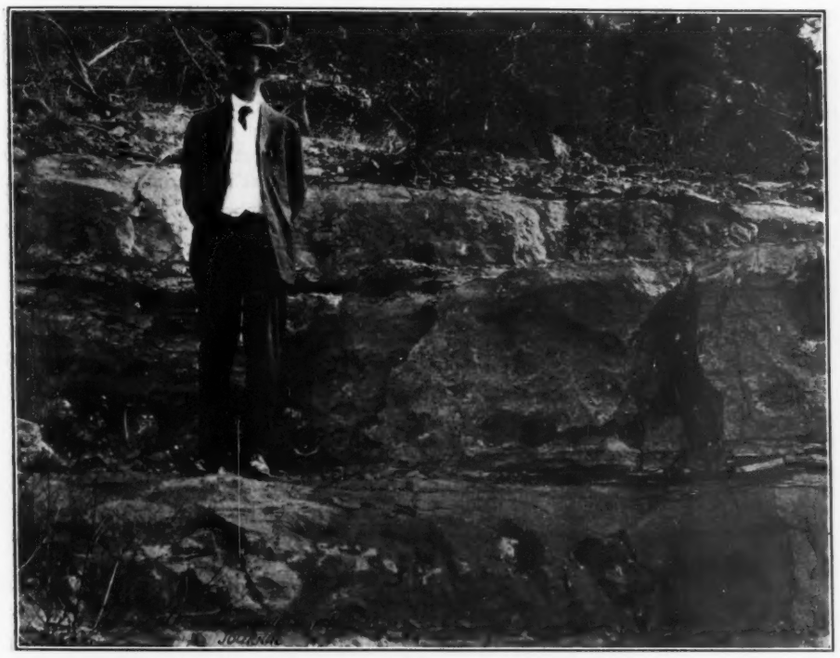
The first shipment of refined copper from Australia was made in May last by the Electrolytic Refining Company, of Australia from Port Kembla, New South Wales.

Texas Celestite Deposits*

By Frank L. Hess†

Celestite, strontium sulphate, is one of the rarer minerals which, although not of great economic value, is of considerable general interest because of its rarity. In the United States there are but few deposits of celestite which are capable of commercial exploitation. A deposit, which could possibly be worked should the demand for the mineral warrant, is situated about five miles north and a little west of Austin, Tex., in two hills on the east side of the Colorado river. These hills, known as Mount Bonnel and Mount Barker, have an elevation of about 800 ft. above sea level, and rise 400 ft. above the river.

A narrow saddle separates the two hills, and through this a wagon road has been cut to a depth of from 16 to 20 ft., affording good exposures of the country rock, which is a flat-lying, somewhat sandy and clayey, Cretaceous limestone belonging to the Glen Rose formation. The celestite seems to be limited to a zone about 9 ft. thick in this limestone, the lower edge of the zone coinciding with the bottom of the road cut. The strontium-bearing beds are also exposed on the river face of Mount Bonnel. What digging has been done is just north of the cut on the west side of Mount Barker. Celestite is also found in the Glen Rose formation in the vicinity of Lampasas, Texas.



CAVATIES FILLED WITH CELESTITE IN GLEN ROSE LIMESTONE NEAR AUSTIN, TEXAS

Occurrence

Near Austin the celestite occurs in rounded cavities which are partially, or wholly, filled by the mineral. These pockets are somewhat irregularly distributed through the limestone. In places there are but few, and those small, while at other places the cavities are large, from 6 to 18 in. in diameter, and sometimes almost touch one another. Usually the cavities are nearly filled with celestite, but in all that were seen, a part of the mineral has been dissolved by percolating waters. A portion of that taken into solution has been redeposited as strontium carbonate upon the etched crystals of celestite, in beautiful acicular crystals which form masses having an appearance almost velvety from the thickly spread and delicate points. The celestite rarely shows definite crystal faces, owing to the etching and to the fact that the cavities have been so filled that the crystals have coalesced and lost their individuality. In color it ranges from white to dark blue. Much of it is a delicate light blue comparable to that of the sky, whence the name celestite. Dark blue crystals are comparatively rare.

The specific gravity of celestite is about 3.9, as compared with 2.7 of limestone. It is probable that an approximation of the amount contained in the limestone may be fairly obtained by estimating the comparative areas of the cavities and the face of the limestone, although as remarked, a portion of the celestite has been dissolved and carried away. Based on measurements made upon photographs, it is estimated that the limestone contains not over 5 per cent. of celestite in the richest part seen.

Commercial Aspects and Uses

The deposits can be easily worked, as the limestone is comparatively soft and is well exposed on the side of a hill where excavation and dumping would be easy. At one time 14 tons of celestite was dug and shipped to Germany, but upon the arrival of the consignment in Germany it was found that the price which the shipper had been advised could be obtained for the celestite was several times the market value, and money was lost on the shipment.

Celestite, as such, is sparingly used in pyrotechnics for making red fire. For this purpose, however, the nitrate, carbonate and chlorate of strontium and the strontium-potassium chlorate are much more used. The carbonate is also used in making irridescent glass. The hydrate is largely used in the preparation of beet sugar, and in the separation of crystallizable sugar from molasses. The use of this compound depends upon the property of the oxide and hydrate of strontium to form saccharates, which are readily decomposed by carbon dioxide. Strontium hydrate is said to be preferable to lime for use in sugar manufacture as the saccharate of strontium is more granular than that of lime. The acetate, arsenite, bromide, iodide, phosphate, lactate and strontium caffeine sulphonate are used in medicine. The chloride is sometimes used in alcoholic solution to produce red flames; the monosulphide in luminous paints, because of phosphorescent properties, and the hydrated dioxide for bleaching. The peroxide, one of the later productions of the electric furnace, is used as an oxidizing agent for organic compounds.

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†Of the U. S. Geological Survey, Washington, D. C.

Iron Ore Reserves

A statement prepared by John Birkinbine, of Philadelphia, who has for many years made a study of the iron-ore question, for the use of the Finance Committe of the United States Senate, gives the following brief concluding summary of the probable iron-ore reserves of the United States:

"The reserves of iron ore in the Lake Superior region, of material such as is now shipped, exceed 1,600,000,000 tons, and that this amount may be greatly augmented by the utilization of some ore not now classed as desirable.

"That in the Adirondack district of New York the ore reserves amount to 125,000,000 tons, which may be supplemented by 25,000,000 tons of other New York ores and the possibility of large future additions from the deposits of Clinton ores in the center of the State.

"That New Jersey has over 35,000,000 tons of available ore, and in addition 100,000,000 tons of concentrating ore can be obtained.

"That Pennsylvania has reserves amounting to 45,000,000 tons, which may be in-

creased by liberal exploitation of Clinton and carbonate ores.

"That the Southern States may be counted on for a supply exceeding 1,200,000,000 tons, and possibly a much larger amount.

"The reserves in the Rocky Mountain region and west of this, tentatively estimated as 100,000,000 tons, cover but a small part of the producing territory.

"That the New England and other Atlantic States and the Central States, including Indiana, Illinois, Iowa, Mississippi, Missouri, Arkansas and Texas will further add to the reserves."

It will be observed that Mr. Birkinbine, whose knowledge of the subject is generally admitted, is much more cautious in his estimates than some other writers, who have recently approached this question. His total amounts to 3,130,000,000 tons, without counting the additions which may be made by the use of concentrating processes and by possible improvements, which may permit the use of lower-grade ores than are now considered available for the blast furnace. These supplemental reserves are about entirely a matter of conjecture, so far as their quantity is concerned. The same may be said of possible new discoveries.

The following table gives a statement, also submitted to the Finance Committee, of the iron-ore reserves owned and controlled by the United States Steel Corporation. The first column includes ores of the standard now considered commercially available; the second, silicious and other low-grade ores, which may hereafter be brought into use by concentration or other treatment:

	Standard Ores.	Low-grade Ores.	Total.
Northern ores	1,258,289,000	365,845,000	1,624,134,000
Southern ores	459,300,000	239,000,000	698,300,000
Total.....	1,717,589,000	604,845,000	2,322,434,000

This would show that, according to the estimate of Mr. Birkinbine, the Steel Corporation controls about 55 per cent. of the reserves of ore of the standard now commercially available, without counting its low-grade ores.

The Pilbarra Asbestos Company in 1908 took out 40 tons of high-grade asbestos in development work on its mines at Tambourah, in the Pilbarra district of Western Australia.

According to statistics collected for THE MINERAL INDUSTRY the total lead production of the United States in 1908 was 314,067 short tons, worth $26,381,628. The 1907 production was 350,130 short tons, worth $37,288,845.

A financial group of Nancy (Meurthe et Moselle) has taken options on concessions of potash salts in Alsace. The first drillings lead to a conclusion that the deposit is at least as rich as that of the best mines of Stassfürt.

Sulphide Corporation

SPECIAL CORRESPONDENCE

This company owns the Central mine at Broken Hill, New South Wales, and smelting works at Cockle creek. For the year ended June 30, 1908, only a small profit was earned mainly on account of the low price of the metals produced, namely, lead, silver and zinc. During this period the new mill was only for a portion of the time in complete working order. The results obtained by the new plant are now considered satisfactory and fully equal to expectation. The crude ore is treated by a continuous process, lead concentrates being produced in one section and zinc concentrates in another, by which means nearly the whole of the valuable metal content is recovered in the form of salable concentrates. The recovery in June amounted to 90.4 per cent. of the silver, 96.6 per cent. of the lead and 87.7 per cent. of the zinc.

During the year 191,594 tons were passed through the mill, producing 33,674 tons of lead concentrates and 54,842 tons of zinc concentrates. The costs for the half year ended June 30, 1908, on 100,943 tons of crude ore treated were £5 16s. 6d. per ton of lead concentrates and £1 3s. 2d. per ton of zinc concentrates. For the 20 weeks ended Nov. 14, 1908, the costs were £5 6s. 11d. and 19s. 2d. per ton, respectively.

In addition to the production from the new mill 80,900 tons of dump tailings were treated by the flotation process producing 29,042 tons of zinc concentrates, and 43,508 tons treated by the magnetic process produced 15,155 tons of concentrates. The magnetic plant has now been shut down as the flotation process gave better results.

In this connection it should be mentioned that two flotation plants were at work, and that the plant owned by the Minerals Separation Company has given the best results. This plant treated 34,506 tons of tailings assaying 7.4 oz. silver, 6.1 per cent. lead and 20.1 per cent. zinc from which 12,529 tons of concentrates were obtained assaying 15.4 oz. silver, 11.2 per cent. lead and 44.7 per cent. zinc, representing a recovery of 74.2 per cent. of the silver, 65.2 per cent. of the lead and 80.5 per cent. of the zinc.

A slimes plant has given excellent recoveries from a product which in the past had resisted satisfactory concentration. The recoveries have reached 78.9 per cent. of the silver, 78.9 per cent. of the lead, and 86.3 per cent. of the zinc. During the latter part of the period when it was adjusted into fair working condition 1930 tons of slime yielded 1020 tons of concentrates, containing 25.9 oz. silver, 25.9 per cent. lead, and 33.2 per cent. zinc. At the smelting works at Cockle creek the input of lead concentrates, purchased ores, etc., was 73,351 tons, which yielded 21,813 tons of bullion containing 92,195 oz. gold, 2,147,904 oz. silver. The zinc distilling plant treated 3462 tons of zinc concentrates, producing 967 tons of spelter.

According to the chairman of the company the production of zinc is in few hands and, therefore, the regulation of spelter output ought not to be a difficult matter. The maintenance of the price at a point remunerative both to works and mines is so much a matter of common interest that the establishment of a convention for the purpose in the near future is regarded as probable. Regarding lead and silver the position is more uncertain, but better prices than those obtained during the year under review are expected and are necessary for the success of the company.

Sulphuric Acid Making at Ducktown, Tenn.

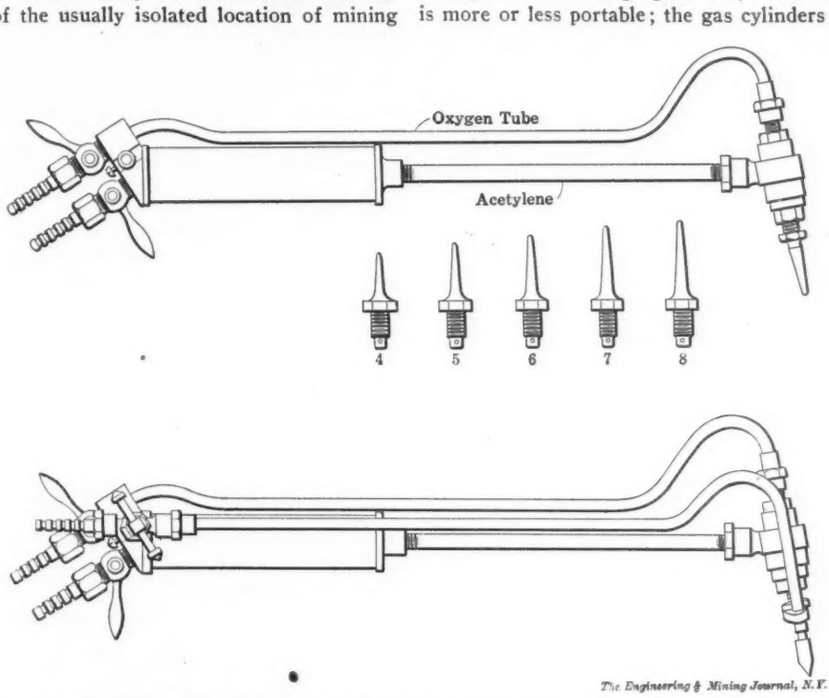
According to data communicated at the recent annual meeting of the Ducktown Sulphur, Copper and Iron Company, the sulphuric-acid plant, in connection with the pyritic smelting furnaces, went into operation on June 11. This was several months in advance of the anticipation of the contracting chemical engineer, N. L. Heinz. The plant, which is designed with a view to future extension, consists of 16 chambers, aggregating 1,050,000 cu.ft. There are three towers, all contained in two buildings of structural steel. The capacity of the plant is rated at 160 tons per day of acid of 60 deg. B. The construction was done rapidly. Ground was broken in July 14, 1908, wherefore, the plant was completed and put in commission in about 11 months. In the construction of the plant 1350 tons of lead, over 1,000,000 ft. of timber and 6000 cu.yd. of concrete were used. The cost of the plant was $305,000, which comes to about $5.50 per ton of annual capacity.

The exploration of the coal seams in the east of France is continued with great activity, owing to the success met with in a drilling made at Gironcourt by the Buffet group. This same group is boring at Aulnois, close to the railroad from Mirecourt to Neufchateau. Other drillings are being made at Foulain, at Jévoncourt in the Madon valley, and at Brion-sur-Ource in the department of Aube; while some Paris people are said to be preparing to drill at Château-Villain in the Haute Marne.

There were 32 dredges at work in New South Wales at the close of 1908, in the recovery of tin ore, or stream tin; three being bucket dredges and 29 pump dredges. The quantity of stream tin saved during the year was 1562 tons, of $632,400 estimated value.

Autogenous Welding for Mining Machinery

Autogenous welding is accomplished by means of an oxy-acetylene flame applied by a torch or blowpipe to the parts to be joined. The necessary apparatus consists of an acetylene generator, oxygen generator, containing tanks, a small compressor, together with torches of various sizes. The acetylene generators are made in various sizes, using 20, 50, 100, 200, or 300 lb. of carbide per charge. The acetylene gas is generated under a pressure of 5 to 15 lb. per sq.in. as required. The oxygen generator may be dispensed with when it is possible to buy oxygen and have it shipped in drums, yet for mining purposes it would hardly be advisable on account of the usually isolated location of mining camps. It is necessary to have a supply at hand, and one of the important essentials is that the oxygen be pure.



THE UPPER ILLUSTRATION SHOWS THE TORCH WITH VARIOUS SIZED TIPS. THE LOWER ONE SHOWS THE SAME TORCH WITH CUTTING ATTACHMENT

The torch is the chief and most important factor in the success of the operation. This torch is furnished in various sizes, 14 in. to 2 ft. long, and each one is provided with half a dozen tips. For light work the small tip is used, but for extra-heavy work it is necessary to use a large torch and a large tip. The accompanying illustration shows the torch used for welding, also the cutting attachment, which consists of a tube and tip for supplying an extra quantity of free oxygen.

The cutting of steel plates, bars, or castings, is effected by applying the blowpipe flame along the line to be cut. The heat is so intense that it melts the metal, and this coming in contact with the oxygen rapidly oxidizes, leaving a clean-cut channel. The makers, the Davis-Bournonville Company, claim that by this method steel up to ½ in. thick may be cut at the rate of 60 linear ft. per hour, and 1½-in. steel may be cut at the rate of 40 ft. per hour.

The rate of welding varies with the thickness of the metal, oxygen pressure and size of torch; the welding of 7/16- to ½-in. steel plate may be done at the rate of 5 ft. per hour. The parts to be welded are beveled to allow the flame to play well into the metal; the intense heat fuses the edges and they unite readily. It is usually necessary to add some extra metal of the same kind by melting the end of a rod and allowing it to drop on the joint, as is done when using solder.

An outfit of this character should find a large use in mining operations, since it is more or less portable; the gas cylinders may be taken from the generating plant to any part of the mine, mill or smelter. The cylinders contain enough gas for any ordinary piece of work. In the event that the gas does give out, all that it is necessary to do is to refill the tank. It often happens that a piece of machinery breaks and there is no duplicate to be had nearer than the factory. If the mine is an isolated one, the long delay entails a serious loss. With this appliance it is possible to repair broken flywheels, pumps, water mains, and even the heavy castings and framework of engines, hoisting plants and dredges. It is also useful in building up or repairing gear wheels, in which case the metal is added and then filed down to its proper size and shape. It is also a valuable aid in repairing boilers, as by this appliance it is an easy matter to cut out a defective part and weld in a new piece of like dimensions, doing away with the necessity of punching holes and riveting. With this process aluminum, copper, brass and alloys are welded. It is claimed that the temperature attained by the oxy-acetylene flame is 6300 degrees.

European Zinc Companies

SPECIAL CORRESPONDENCE

The Société des Mines de Malfidano, a large zinc producer, lost nearly $100,000 last year owing partly to the low price of metals, but mainly to the bad working of its Noyelles-Godault works. The company of Malfidano was given leave by the shareholders to exchange the mines of Faucon l'Argentière and La Môle for the concession of Poullaouen, near its concession of Huelgoat, where development work is now carried on. It is said that the Société de la Vieille-Montagne would give its technical and eventually financial help, while the Malfidano company would supply the Vieille-Montagne with crude zinc. The latter would thus develop its strong position in the zinc market to which it brings about one-fifth of European consumption. The Vieille-Montagne company works 40 mines in Belgium, France, Algeria, Tunis, Germany, Italy, England, Sweden, Spain and Sardinia, and its works are located in Belgium, France, Germany and Sweden and produce crude zinc and rolled zinc. It is also a large producer of sulphuric acid and superphosphates. The enormous development of this company was obtained by investing part of the yearly profits; the capital has not been increased since 1845, and loans issued in 1866 and 1871 have been completely paid off.

The largest nugget ever found in Australia was called the Welcome, and was mined at Ballarat by a party of miners, one of whom, Francis Webster, died recently. The Welcome, says the *Mining Standard*, was found June 19, 1858, at a depth of 180 ft., and weighed 2159 oz. The price paid for it to the lucky diggers was £10,500, but this was a fancy price, and was offered with the idea of recovering a large proportion of it by exhibiting the prize; and after making a good haul in this way, the enterprising showman sold the Welcome for $9325. In November, 1859, the nugget was melted in London, and was found to contain 99.2 per cent. of pure gold, so that it was about $44,200 actual value.

In 1908, according to statistics collected for THE MINERAL INDUSTRY, the United States produced 23,496,666 short tons of coke worth $55,595,792 ($2.36 per ton), while in 1907 the total output amounted to 40,595,238 short tons worth $107,445,050 ($2.65 per ton).

The Pyrometry of the Beehive Coke Oven

Devices Used and Methods Employed in Taking Temperatures. Results of Examination of Beehive Coke Oven Gases During Coking Process

BY J. R. CAMPBELL*

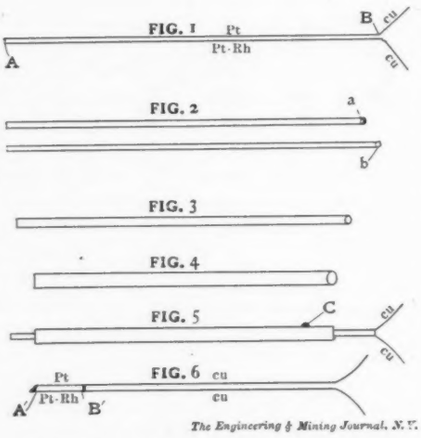
The pyrometer (pyro + meter), derived from the Greek words *pyre* and *metron*, meaning fire and measure, is, literally, an instrument used to measure fire, but we have come to understand this to mean high temperatures in general.

The data recorded in this article has been taken from the ordinary beehive coke oven in the Connellsville region, the oven either burning through the trunnel head or into a waste-heat flue. I do not claim that these temperatures will hold true on other coals, since the constituents of the coal gas will vary in different coals as will the volume of gas per ton of coal, nor do I claim that the temperatures recorded will hold true in a by-product coke oven.

The temperatures to be given have been taken with several devices which will be described somewhat in detail and their relative merits touched upon. For a standard I have taken a form of the Le Chatelier thermoelectric couple, which will be described by the following diagram. Without doubt this is the most accurate apparatus yet devised for measuring and recording high temperatures, but it has its limitations and is open to serious objections as a practical apparatus. The fire end shown in the cut is one made in the laboratory of the H. C. Frick Coke Company and has served its purpose admirably.

Fig. 1 shows the standard thermo-couple, made of two wires of different metals or alloys. In this case one is a platinum wire and the other an alloy of platinum and rhodium, the latter being about 10 per cent. usually. *A* is the hot junction and *B* is the cold junction. The junction at *A* can be made by welding the two wires together in the flame of an oxyhydrogen lamp as is my practice, or they can simply be twisted together. At the cold junction *B* two copper wires are fastened as the formation of lead wires. The couple thus described is about 6 ft. long, a good length for use in a coke oven. This couple when exposed to heat sets up a current of electricity the strength of which can be accurately measured by a sensitive galvanometer or milli-voltmeter, which is calibrated to read in degrees Fahrenheit to within about 25 deg., which is close enough for practical purposes.

Fig. 2 shows small bore porcelain tubes *a* and *b* for insulating the thermo-couple. Fig. 3 shows a cast-iron pipe of sufficient length and diameter to hold the insulated couple, while Fig. 4 is a still larger and shorter pipe for slipping over the whole for a greater protection. Fig. 5 shows the fire end of the pyrometer complete. It is strong and durable, thus overcoming in a measure the fragility of the older fire end which was a couple protected by a porcelain and clay covering. The form described was not designed for stationary use. It is a portable device and intended to make quick readings in high temperatures. The cast-iron pipes when burned up can be renewed. As the reducing gases of a coke oven have a deleterious effect on the couple, the end of the inner cast-iron pipe is filled with a good quality of fire clay.



SIMPLE DEVICES FOR MEASURING TEMPERATURES IN BEEHIVE COKE OVENS

By means of the set screw *C* in Fig. 5 the inner pipe can be moved back and forth for exposure or protection as the case may be. As the limit of such a couple is about 2900 deg. F., the melting point of cast iron along in that neighborhood, and the temperature of a coke oven rarely above that figure in the Connellsville region, such a fire end as the one described has quite a long life in the hands of a careful operator.

In Fig. 6 is shown what is known as the short thermoelectric couple, which is constructed exactly along the lines already described. This couple is only a few inches long as shown by the hot and cold junctions *A'* and *B'*. In the first arrangement the cold junction is always in the air, while in the latter it may be or may not be in the air. In taking oven temperatures per force of circumstances, the latter type would nearly always have both hot and cold junctions in the high temperatures, a bad feature.

Oven Readings Must Be Taken Quickly

It may be well to note here that the cold junction of a thermoelectric couple must be kept at the temperature at which it is standardized, which is usually from 15 to 20 deg. C., or ordinary atmospheric temperatures, to obtain accurate readings on the galvanometer, unless a special compensating apparatus is used, which is not usually the case. This short couple arrangement is very inexpensive and is ideal in theory but very difficult to work in practice. The readings, to be accurate, must be taken in a few seconds, or before the cold junction has its standard temperature destroyed, a thing very difficult to perform in a coke oven where the fire end has to be thrust in 5 or 6 ft. In the operation of this couple the indicator on the galvanometer moves to the maximum almost instantly and then reverses and drops back. If this recession starts before one has the fire end where he wants it, he simply cannot manipulate fast enough to get the temperature correctly.

Then after the reading has been taken, by reversing the current through the galvanometer, a positive reading of several hundred or even 1000 deg. will be obtained. Before another reading can be taken the fire end must be cooled down to the normal temperature of the cold junction.

This form of the thermoelectric couple as devised by Mr. Bristol might prove useful in some cases, but most unfortunately I have had to discard it in the coke-oven practice and revert to the longer and more expensive couple in which the cold junction is not affected materially and in which the indicator on the galvanometer moves more slowly to the maximum. Some form of the Le Chatelier thermoelectric couple properly constructed for the purpose for which it is intended and properly manipulated, no doubt, will remain a standard for accuracy, but there are many objections to it from a practical standpoint, such as the fragility of the fire end and galvanometer, and the difficulty of transportation and manipulation in all places where temperature is desired.

Among the many other devices on the market for the observation of high temperatures, Wanner's optical pyrometer will commend itself to every practical man for the simplicity of construction, ease and rapidity of manipulation and accur-

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acy of results. This device will be detailed somewhat as it has especial merit. In fact, some of the temperatures to be given were made with this instrument and I consider them most reliable.

The Wanner Optical Pyrometer

The principle on which the use of this pyrometer depends is the same as in the various older forms, that is, the comparison of the quantity of light emanating from the heated mass to be measured, with a constant source of light. An osmium lamp of the necessary voltage is used as the standard light.

Looking through the pyrometer, a circle of light appears, divided into distinct halves of different intensities of light. By turning an adjustment on the pyrometer, these two halves can be made to appear alike or matched as it were. I have jocosely referred to this in reading coke-oven temperatures as the appearance of the full moon—only it is a blood-red one. Then the temperature is easily read from the scale on the adjustment with the aid of a table. This type of pyrometer must be standardized at least once a day against an amylacetate lamp flame after which the osmium lamp is regulated by a resistance, which is switched into the lamp circuit.

The personal equation, of course, is a factor in the operation of this pyrometer, but I have no hesitancy in recommending it in commercial work. A careful observer with unimpaired vision will get excellent results. However, one cannot examine particular points in a coke oven as with a thermo-couple. The results obtained by these two types of pyrometers have always agreed in the oven work, and I have seen many observations by each.

Among the other means of taking the temperatures of coke ovens, the remaining most important one is by means of the Seger cone. This method is familiar to everyone, hence need not be detailed here, and for a long time performed the function of recording high temperatures. In this connection it need only be noted that the melting points of the silicate mixtures which compose the Seger cone, do not correspond with scientific exactitude to definite temperatures, because the fusion of any complex substance is not wholly a matter of temperature. It depends upon the rate at which the heat is applied, the fineness of the grain of the mixture, the chemical conditions of the heating process, etc. For the above reason the Seger cone is not reliable, but it is understood that it does serve a useful purpose in the ceramic industry when exactitude is not absolutely required.

I have discussed three modes of recording high temperatures in the order in which I consider they should stand as to accuracy: First, the Le Chatelier thermo-electric couple; second, the Wanner optical pyrometer; third, the Seger cone. For all practical purposes it would not be unfair to put the Wanner optical pyrometer in first place.

The Theory of High Temperatures in a Beehive Coke Oven

It has always been my practice to set before me a theory from which the practical problem is evolved. The theoretical problem may or may not be correct, but the training is invaluable. Accordingly the theory of the combustion of coal gases in a beehive oven will be set forth roughly, as it were, from which certain conclusions may be drawn, which otherwise would be lost sight of.

By reference to the tabulations it is to be expected that by complete combustion of the oven gases we should attain a temperature of about 3500 deg. F. in a beehive coke oven, but since this condition is rarely, if ever, obtained in the Connellsville practice, whether from the standpoint of good practice or not, I am not in a position to judge, certain corrections must be made. In the past I have made a somewhat extended examination of the beehive coke-oven gases during the coking process, and for the purpose of this article, without detailing a large number of individual analyses taken at various stages in the coking process, I will assume what I consider a fair average.

The assumption is made that the combustible gases found in the coke oven are simply distilled out and not burned, though such may not be the case. It is more than likely that the hydrogen found in the oven gas is formed by the decomposition of the H_2O formed in the combustion process, which process also furnishes oxygen for further combustion of the hydrocarbons. This seems reasonable since the ignition point of *H* is below C_2H_4, CH_4, or CO. It should be the first gas burned theoretically. In view of these theoretical considerations the maximum temperature of a coke oven is 3550 deg. F., and with a loss of 600 deg. F., due to incomplete combustion, this is reduced to 2950 deg. F. There is one other source of loss, also, the loss by radiation.

Without multiplying the data, I will proceed to give some actual pyrometric tests, made on beehive ovens of various types. One can readily follow the theoretical with the practical test.

COMPOSITION OF COAL GAS.

	By Volume.	By Weight.
Carbon dioxide (CO_2)	2.00	6.80
Ethylene (C_2H_4)	5.50	12.00
Oxygen (O_2)	0.50	1.20
Carbon monoxide (CO)	11.50	24.70
Hydrogen (H_2)	43.50	7.70
Methane (CH_4)	35.00	43.20
Nitrogen (N_2)	2.00	4.30

Temperatures Produced by Burning in Air.

Carbon monoxide (CO)	2828 deg. C.
Hydrogen (H_2)	2080 deg. C.
Methane (CH_4)	1935 deg. C.
Carbon (C_2)	2450 deg. C.

Therefore

0 deg. x 6.80 = ...
2450 deg. x 5.10 = 12,495.0 deg.
0 deg. x 1.20 = ...
2828 deg. x 24.70 = 69,851.6 deg.
2080 deg. x 7.70 = 16,016.0 deg.
1935 deg. x 50.10 = 96,493.5 deg.
0 deg. x 4.30 = ...

100)195,306.1

1953 deg. C. = 3,547 deg. F.

$C_2H_4 = CH_4 + C$
therefore
12.00 of C_2H_4 =
5.10 C. and 6.90 CH_4
and 43.20 CH_4 + 6.90 CH_4
= 50.10 CH_4

BEEHIVE COKE OVEN GAS.

	By Volume.	By Weight
CO_2	3.00	5.30
CO	9.00	9.95
H_2	12.00	1.10
C_2 or CH_4	1.00	0.65
N_2	75.00	82.95

0 deg. x 5.50 = ...
2828 deg. x 9.95 = 28,138.6
2080 deg. x 1.10 = 2,288.0
1935 deg. x 0.65 = 1,257.75
0 deg. x 82.95 = ...

100)31,684.35

317 deg. C. = 600 deg. F.

3550 — 600 = 2,950 deg. F.
maximum temperature

Combustion of Coal Gas.

(1) $C_2H_4 + 3\ O_2 = 2CO_2 + 2H_2O$
(2) $2CO + O_2 = 2CO_2$
(3) $2H_2 + O_2 = 2H_2O$
(4) $CH_4 + 2\ O_2 = CO_2 + 2H_2O$

(1) 1 vol. C_2H_4 + 15 vol. air = 2 vol. CO_2 + 2 vol. H_2O + 12 vol. N_2
(2) 2 vol. CO + 5 vol. air = 2 vol. CO_2 + 4 vol. N_2
(3) 2 vol. H_2 + 5 vol. air = + 2 vol. H_2O + 4 vol. N_2
(4) 1 vol. CH_4 + 10 vol. air = 1 vol. CO_2 + 2 vol. H_2O + 8 vol. N_2

(1) Multiplying by 5.50 = 11 vol. CO_2 + 11 vol. H_2O + 66 vol. N_2
(2) Multiplying by 5.75 = 11.5 vol. CO_2 + 23 vol. N_2
(3) Multiplying by 21.75 = + 43.5 vol. H_2O + 87 vol. N_2
(4) Multiplying by 35.00 = 35.0 vol. CO_2 + 70.0 vol. H_2O + 280 vol. N_2
(5) Already present = 2.0 vol. CO_2 + 2 vol. N_2

Total product of combustion =
59.5 vol. CO_2 + 124.5 vol. H_2O + 458 vol. N_2
or 100 vol. gas = 642 vol. of the products of combustion
Then 1 cu.ft. = 6.4 cu.ft.

TEMPERATURE OF BEEHIVE OVEN DURING COKING PROCESS.

2110 deg. F.	3 hr.
2285 deg. F.	6 hr.
2460 deg. F.	9 hr.
2490 deg. F.	12 hr.
2660 deg. F.	15 hr.
2765 deg. F.	18 hr.
2560 deg. F.	21 hr.
2660 deg. F.	24 hr.
2800 deg. F.	27 hr.
2725 deg. F.	30 hr.
2725 deg. F.	33 hr.
2660 deg. F.	36 hr.
2560 deg. F.	39 hr.
2490 deg. F.	42 hr.
2370 deg. F.	45 hr.

Average 2555 deg. F.

This was a 48-hour charge burning normally in a 12 ft. 6-in. beehive coke oven. The test was taken on a plant which used the waste heat of the oven for operating the boiler plant by means of the familiar short flue connecting the oven to a main waste heat flue which led under the boilers. I consider the tabulation as a fair average. For the purpose of this article the readings are assumed to be taken every three hours. As a matter of fact, the first reading was taken after the charge was burning freely and the last just before the oven was watered. The main object is to show the variation of the temperature during the coking process.

The Variation in Temperature During Coking

One interesting thing to note in this connection is the fall in temperature along about the 21st hour of the coking process. This was caused by the "watering out" of the oven next to it. It will also be noted that the maximum temperature of 2800 deg. F. is attained when the coking process is about half completed and the minimum is at the incipient stage of the coking process; also, that the temperature at the close is slightly greater than at the beginning.

These conditions could almost be formulated into a universal law. It is understood that in particular instances higher temperatures than the 2800 deg. have been obtained.

Also it may be pointed out the beehive coke oven from which the waste heat is utilized may burn hotter than the same oven burning into the air. This is due to the increased draft on the flue oven which leads to completer oxidation of the coal gases. This brings us sharply back to the statement made previously as to whether this is consistent with the best practice of coke making from the standpoint of the yield of coke to coal and the physical quality of the coke itself. I am not prepared to enter into a discussion of these and kindred points but would point them out. The complete combustion of coal gases gives us:

CO_2 ..... 11.50 and 3550 deg. F.
N_2 ..... 88.50

This means that we are approximating the greatest possible temperature to be obtained in a coke oven. This brings in a new factor, the question of the refractories used in oven building, and I desire to say that this is a pretty serious problem for the manufacturer of oven brick, and a still more serious one for the operator who is being handicapped at every stage of the game, on this score, in his efforts to make progress in modern equipments. He is "up against it good and proper." This has led him to devise all kinds of schemes to get away from the evil effects of this intense heat and falling flues and ovens. Some operators have adopted the air-cooled, overhead connecting flue instead of the regulation short flue, but this is at the sacrifice of heat, which means power to the boiler plant. This point is illustrated by the following pyrometric readings:

Regulation short flue ..... 2650 deg. F.
Air-cooled over-head flue ..... 2300 deg. F.

These tests were made on a 48-hour charge after the oven had been burning normally for about 18 hours. There is a dissipation of 350 deg. F., which means power to the boiler plant.

It has been noted that the waste-heat gases are conducted under the boilers, where the temperature is approximately 2000 deg. F. When we figure that the average temperature of the beehive flue oven is 2550 deg., here again comes a heavy loss of heat and power. This, no doubt, is caused by radiation and would be hard to overcome.

TEMPERATURE IN BEEHIVE COKE OVENS AT VARIOUS POINTS.

Kind of Oven.	Kind Charge.	Time Burnt.	Point Where Temperature Was Taken.	Deg. F.
Bank Beehive...	48 hrs.	24 hrs.	Front of oven directly inside of arch.	1600
Bank Beehive...	48 hrs.	24 hrs.	Top of charge 4 ft. 0 in. inside of arch.	1850
Bank Beehive...	48 hrs.	24 hrs.	Crown of oven 3 ft. below trunnel.	2350
Bank Beehive...	48 hrs.	33 hrs.	Front of oven directly inside of arch.	1525
Bank Beehive...	48 hrs.	33 hrs.	Top of charge 4 ft. inside of arch.	1950
Bank Beehive...	48 hrs.	33 hrs.	Crown of oven 3 ft. below trunnel.	2250
8 ft. Rect.....	48 hrs.	30 hrs.	Front of oven directly inside arch.	1925
8 ft. Rect.....	48 hrs.	30 hrs.	Crown of oven 3 ft. below trunnel.	2050
6 ft. Rect.....	48 hrs.	26 hrs.	Front of oven directly inside of arch.	1800
6 ft. Rect.....	48 hrs.	26 hrs,	Crown of oven 3 ft. below trunnel.	2150
Block Beehive..	48 hrs.	30 hrs.	Front of oven directly inside arch.	1550
Block Beehive...	48 hrs.	30 hrs.	Top of charge 4 ft. inside of arch.	1925
Block Beehive...	48 hrs.	30 hrs.	Crown of oven 3 ft. below trunnel.	2500
Block Beehive...	48 hrs.	30 hrs.	Intersection of outside arch with front wall.	800 to 1000
Bank Beehive...	72 hrs.	0 hrs.	Bottom of oven under tile at center of oven.	500
Bank Beehive...	72 hrs.	72 hrs.	At point midway between trunnel and over arch.	1525
Bank Beehive...	72 hrs.	72 hrs.	Maximum temperature inside of trunnel.	2300
Bank Beehive...	72 hrs.	72 hrs.	Bottom of oven under tile at center of oven.	1100
Bank Beehive...	72 hrs.	72 hrs.	Bottom of oven, top of tile, after 16 min. watering.	150

The accompanying tabulation is interesting in that it shows the temperature of special points in a coke oven. The cold air entering the oven over the door naturally lowers the temperature at this point. Also it is a natural conclusion that the hottest part of a coke oven is not on top of the charge but higher up in the combustion chamber. This brings us to the point where the Seger cone may prove misleading. It is usually placed on top of the charge or at the best only a few inches above it.

The Larger Oven Produces a Higher Temperature

The figures in this tabulation were obtained on the straight beehive coke oven burning into the atmosphere. These ovens naturally do not burn as hot as the flue oven, as has been noted, due to the draft not being forced. Then again the smaller beehive oven in the old Connellsville region does not attain the high temperature of the larger oven in the newer fields. Or we may put it like this: In the same field and on the same coal, the larger oven produces a higher temperature generally. We may find the reason for this in the fact that in the larger oven, heavier charges are made and greater volumes of gas are being given off and burned in the prescribed time of coking; consequently there are a greater number of heat units developed, and less chance for radiation. Also, the quantity and quality of the volatile matter is an important factor in this problem. A coal yielding a volatile matter of 33 per cent. will develop more heat units than a coal of 30 per cent. volatile matter, if the size of the charge and the size of the oven remain constant for the reasons already cited; and provided, of course, the coking process is completed in the prescribed times of 48, 72, or 96 hours, respectively, for the various kinds of coke. In bringing this article to a close, I draw the following conclusions based upon experience in connection with the various types of ovens and localities in the Connellsville region:

Maximum temperature attained in:

1. Small type of beehive oven and low volatile matter (comparatively) 2200 to 2400 deg. F.

2. Large type of beehive oven and high volatile matter (comparatively) 2400 to 2600 deg. F.

3. Large type of beehive oven and high volatile matter (comparatively) with flue system for operating boiler plant 2700 to 2900 deg. F.

From which we deduce (a) that a low-grade refractory will serve its purpose in No. 1, hence the longevity of this type of oven; (b) that this same material used in No. 2 fails of its purpose, hence come the many and manifold troubles of the present coke-oven builder and operator, caused by falling ovens; (c) that only the highest grade refractory will stand the heat of No. 3.

Now, the application: Mr. Operator,

thoroughly understand your problem of the beehive coke oven, know what you want done and then solve it along rational and technical lines; do not pursue a willy nilly, haphazard, hit-or-miss plan, but get down to the bottom of the thing and act upon the results of your investigations; there are always several courses open and you must choose the one you want to follow, but whatever course is taken, follow it understandingly.

An Example of Proper Ventilation

The coal industry in the Pittsburg region has recently come into the limelight because of the numerous mine explosions that have occurred in that field. The officials of the Pryor mine at Pryor station, on the Pittsburg Terminal railroad, believe that the safest remedy for the prevention of disastrous explosions is ample and efficient ventilation. The accompanying illustration goes farther to substantiate the assertions of the officials of the Pryor mine than would a lengthy theoretical discussion. The photograph here shown was taken during working hours at a time when 175 men were employed underground.

It is unnecessary to explain that in a bituminous mine, operating in the Pittsburg coal, considerable danger is attached to the act of taking a flashlight photograph at one of the faces of the underground workings, unless those in charge are absolutely sure of the safety of prevailing conditions. The face of the coal is clearly indicated in the photograph and the large lumps are also distinctly shown.

It would be interesting to know how many coal-mine managers, developing gaseous bituminous seams, would be willing to support their claims of ample ventilation at the working faces of their mines by permitting a flashlight photograph to be taken at the face of one of their own chambers.

VIEW AT FACE OF A CHAMBER IN THE PRYOR MINE OF THE MORELAND COKE COMPANY, PITTSBURG, PENN. THE PHOTOGRAPH SUBSTANTIATES THE COMPANY'S CLAIMS OF PROPER VENTILATION

Dangers Attending Use of Electricity in Coal Mines

By James Ashworth*

Several times during and after inquiries into the cause of explosions in collieries, it has been suggested that the use of electricity ought to be curtailed, but up to date, this suggestion has not received many adherents among those who are actively connected with the mining of coal.

It will be remembered that after the explosion at the Monongah mine in West Virginia, attention was pointedly directed to the "network" of electrical wires at the point on the main haulage road of No. 8 mine where the No. 1 north and south entries branched off. These wires were broken down by the force of the explosion, and to what extent the shorts and arcs, that were then produced, contributed to the disaster, has not been much theorized upon. The use of electricity underground necessitates the use of junction boxes, switches and fuses, and at all these points where the continuity of the cables carrying the live current are placed, they necessariy introduce a danger which in spite of all the best apparatus is not entirely removed.

The attention of electricians and all colliery operators and their staffs has been startlingly directed to this subject by the explosion which happened at the West Stanley colliery in England, on Feb. 16, when 178 people lost their lives. The coroner's jury after hearing evidence for 10 days brought in a verdict that the loss of life was caused by an explosion of coal dust, although they were unable to say how the coal dust was primarily ignited.

The West Stanley Explosion

This disaster, as the evidence indicated,

*Mining engineer, "The Cloud," Congleton, England.

was divided into two distinct explosions. The first arrived at the pit tops in the form of smoke and violence, opening the "horse hole" doors and splintering them, and also tearing off the wood work on three sides of the upcast shaft. This effect was soon over and in about a minute the smoke pillar was cut in two, and there was a reverse current in the shafts which sucked down the smoke still in the shafts. Almost immediately after this effect, another column of smoke was projected out of the shafts accompanied by flame, and again the smoke column divided and part returned down the shaft.

The various witnesses who testified at the inquest, stated that the accident occurred between 3:35 and 3:45 p.m. The chief mechanical engineer of the colliery was in the air-compressor house about 3:40 p.m. and suddenly heard a loud burring in the adjacent room where the electrical generating plant was placed. This burring noise after a few seconds, was replaced by a great bang and immediately afterward, the smoke of the first explosion reached the pit top. The engineer then ran to the pit top which was about 90 yd. away, and saw the second explosion. About 3:35, the surface electricians were in telephonic communication with the pump-house motorman, and he informed the generating station that he was about to start the big pump.

Explosion Started in Pump House

That he should give this notice before starting was a rule of the colliery, and therefore nothing unusual could be expected to result from it. However, a careful examination of all the electrical appliances and connections after the explosion brought to light the facts, that the cables (three-phase) were safe and sound, from the generating station to the pumping station. The fuse at the pit bottom was undamaged and although the cable was seriously damaged under a fall about 75 yd. from the pump, there was no external appearance of firing or burning. In the pump house, however, two fuses had their porcelain covers broken, and the switch box was blown to bits. The remains of the switch box were found in different directions and the elbow pipe of the pump was broken. The evidence of force showed that it was about the same at the southeast entry as at the west exit, and these facts point directly to the initiation of an explosion inside the pump house.

The chief engineer stated that the pump had started work, and from the times already stated, it is evident that the starting of the pump and the explosion initiation were practically within say a moment of time. The pumpman was killed, and therefore the evidence which would have cleared up this mystery cannot be available and is consequently entirely problematical.

None of the mining experts who examined the pit and gave valuable evidence, placed the initiatory explosion in the pump house, but they were practically in agreement that it was in the main haulage road, and somewhere between or at a fall of roof 75 yd. outbye of the pump house.

Now the conditions in the main haulage road were most favorable to a disaster if only it could be proved that an explosive had been used anywhere about this point, but as a matter of fact, it was most clearly shown that in none of the mines worked from these shafts had there been any shot fired about the time of the explosion. It would appear that when the set of full cars of coal were at the "curve" something went wrong and the engine was signaled to stop, it was then signaled to move on and this time the engine was stopped without signal, as the train was fast. At this moment the explosion occurred. It is clear, therefore, that the air in the haulage road would contain a considerable quantity of both old and new dust in the intake current as a natural result of the movement of the cars, and this dust would also enter the pump house with the air. The bursting of the switch box at this instant supplied the necessary flame, and initiated the explosion. The evidence of the onsetter who was recovered alive, and remained unconscious for three weeks, showed that the people working about the pit and on the haulage road had some intimation that an explosion had occurred, because they were all found some distance from their proper places, and the onsetter heard the noise before he became unconscious.

If, therefore, electricity is to be used underground, it is evident that switches for use underground will require more attention both in construction and in use. And as it has been demonstrated that a switch when immersed in oil affords no protection and becomes useless when dirt or coal dust is mixed with the oil, it is clear that switch boxes must be absolutely dust tight, or they must have more frequent attention to ascertain if the oil is in proper condition and that no chemical change has taken place.

The use of electricity underground is much more general on the American continent than elsewhere, and, therefore, it behooves every maker and user of electrical appliances to make these details of installation as nearly safe, as it is possible for human ingenuity to do.

Colliery Notes

The mine inspector's proper work is to overlook the methods adopted, and the provisions made for securing the safety of the men employed in and about the mines, rather than to attempt to examine each working place. The more detailed examinations at a colliery should be made by the mine officials themselves. An inspector accomplishes the greatest good when he succeeds in establishing a high standard of management.

Where wire-rope guides are used, it has been found practically impossible to contrive a safety appliance which can be relied on to hold the cage in case of the rope breaking. Such an apparatus must be effective when needed, and at the same time secure against coming into operation when not needed. Where such an apparatus was recently tried, the usual result happened, one of the grasping hands got hold before the others, with the result that the cage was almost turned upside down.

In developing the coal seams of Scotland, the early method of mining the coal on the pillar-and-room system has practically disappeared, except where the surface must be protected. Even the thickest seams are now worked by the longwall method. In one district where the bed is 25 ft. thick, this latter system is used, and the coal is mined in from two to four horizontal slices, or lifts; in another district where the seam is 11 ft. thick, the longwall method has been adopted, and the coal is taken out in two slices. Even under the sea, the longwall system is used when the depth of the seam exceeds 800 feet.

In the prevention of accidents on haulage roads the more careful colliery managers have provided manholes at specified distances; the entrance to these manholes is kept whitewashed. One disadvantage of this precaution is due to the fact that the warning of a "runaway" is so short that the refuge hole can seldom be reached in time. Therefore, in providing still greater safety, it is advisable to install stop blocks and runaway switches. The most certain way to prevent fatalities on haulage roads is to keep all such gangways in the best of shape, and to drive them higher and wider, so that a person may stand clear of a passing trip at any point.

Now that the use of permitted explosives is becoming more general in this country, it is well to remind shot- firers that it is dangerous, if not illegal, to fire even the permitted explosive near inflammable gas, or in any place where the safety lamp shows the slightest cap. If a charge of permitted explosive is put in coal already partially broken down by a previous shot, or if it is placed in a thin layer of top coal which easily breaks away, a rapid flash of flame is the result, and any inflammable gas that is present will surely be ignited. The advance of the coal-mining industry in this country to the use of permitted explosives is most fortunate and to be commended; however, many fatalities will result if miners attempt to interpret the use of these safer explosives to mean that greater liberties may be taken.

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The Prospects for Copper

With respect to the report of the Copper Producers Association for June, we might simply reiterate the comments that we made regarding the May report. In June there was a further reduction of the visible accumulation in America, which again was more than offset by the increase in the accumulation abroad, showing that the process of transferral was still going on in June. In June also there was a further increase in the production of the American refineries, the average daily output of which was 3,885,583 lb., against an average of 3,817,000 lb. in May.

One thing is now standing out very clearly, namely that no restriction of production (unless it be purely arbitrary and artificial) is to be expected at the present level of prices. For upward of 20 months, the average price for copper has been in the neighborhood of 13c., and production has steadily increased. The number of high-cost mines that have been closed is comparatively few and their aggregate output relatively insignificant. The increasing production at the recent level of price confirms the statement that we have frequently made to the effect that 13c. affords a fair profit on the bulk of the American production of copper. Any natural restriction of the production at the present level of price, or indeed at a little lower level, is therefore not to be expected.

The immediate future of the market depends consequently upon the increase in actual consumption. The Copper Producers Association has at this time made a report respecting the domestic deliveries of copper since January 1, which foots up to a total of 302,000,000 lb., or a little more than 50,000,000 lb. per month. For the first four months the average was about 45,000,000 lb. per month. In May the deliveries jumped to 61,000,000 lb. and in June they were 60,000,000 lb. No one seriously believes, we think, that there was any such sudden increase in actual consumption in May. It is well known that some large manufacturers during the heavy purchasing at that time provided for their requirements for a long time ahead. We are inclined to think that the actual domestic consumption during the first six months of 1909 was about 270,000,000 lb., or at the rate of 540,000,000 lb. per annum. In 1908 the consumption was 448,500,000 lb. The maximum domestic consumption was 668,576,000 lb., or an average of a little more than 55,000,000 lb. per month, in 1906.

The world's production and consumption of copper during the last 10 years as reported by the Metallgesellschaft, Frankfurt am Main, are given in the accompanying table. The figures as to production are somewhat different from our own, but we use them as given in order to match the statistics for consumption as reported. These statistics show an arithmetical average of 15.47c. per lb., and a weighted average of 15.50c. In other words the world has been willing to pay about 15½c. for 6,120,200 metric tons of copper used during the last 10 years. The average is, of course, inflated by the extraordinarily high prices that were realized in 1907-08, and we should, therefore, hesitate to say that because the world has bought its requirements for copper during the last 10 years at about 15½c., the chances are that it will do approximately the same during the 10 years next coming. However, it would seem to us that, taking this long view, an average of 13½ to 14c. might conservatively be expected. Over such a long period the criterion is not the cost of production, but rather what the world will be willing to pay.

WORLD'S PRODUCTION AND CONSUMPTION OF COPPER.

(In tons of 2204.6 lb.)

Year.	Production.	Consumption.	Price.[1]
1899	478,200	467,700	16.67c.
1900	499,200	512,700	16.19
1901	534,800	494,200	16.11
1902	553,300	582,500	11.63
1903	591,300	586,700	13.24
1904	647,900	662,400	12.82
1905	693,900	727,400	15.59
1906	717,800	727,600	19.28
1907	703,000	657,300	20.00
1908	738,900	701,700	13.21
Totals	6,167,300	6,120,200	15.50c.

[1]Quotational averages, cents per pound, at New York.

However, the question of immediate concern is not the price for copper in the long run, but the prospect for the near future, say the next 12 months. This as we have already remarked depends almost entirely upon the further development of consumption. In order to take care of the current production and absorb the surplus, consumption must exceed the largest on record, of which it is at present still very far short. Notwithstanding the admitted revival in business, it is impossible to see any indications that will quickly cause the consumption of copper to jump above the maximum of 1906. While history, especially that of the last 10 years, has shown a rather steady forging ahead in production, consumption

has experienced a succession of bounds and rebounds, which unbalancing of conditions is, of course, precisely what has been responsible for the great fluctuations in price.

The erratic development of consumption is easily explained by a little reflection. Many years ago there was a very large requirement of copper for sheathing ships. As wooden ships went out of use, a large consumption of copper was cut out, but in the '80s this was much more than made good by the electrical development of the world—first with telephone and lighting plants, next with power plants, then with trolley lines, and finally with long-distance transmission of power. Now this development cannot be expected to go on in geometrical ratio. The most fruitful fields for telephone, lighting, power and trolley plants have already been exploited, and the cream has been skimmed off of hydroelectric development. Undoubtedly there will be a new wave of important electrical development—perhaps, indeed very likely, the electrification of the steam railways—but this is not yet fully in sight. We may have to wait several years for such a leap in consumption as we had from 1903 to 1905, and even in the event of such a leap it may not be until a year later that the effect upon price will be fully evident. The over-production in 1901 caused a fall in price which ranged at a low level until 1905, although consumption increased handsomely and was not greatly out of balance with current production. It was not until 1905 that consumption began sharply to outstrip production and by absorbing accumulations resulted in an extraordinary rise of price.

We must not, therefore, be disappointed by the failure of the market to recover more rapidly from the relatively low average of 1908. We must not even be disappointed if we should have a further relapse, because insofar as basic conditions govern there is no reason why copper should not be produced at as low as in 1902, and if consumption should fail to progress the price will inevitably go lower. The only restraining condition that differs from those of a few years ago is perhaps the more general appreciation of the bearing of capital account upon cost of production and the less tendency to give away capital in order to keep going. The present comparative cheapness of carrying the accumulation helps producers in standing out for the price that they think they ought to get.

In December last we expressed the opinion that 1908 would be a year of small ups and downs in the copper market. The history of the first six months has fully borne out this forecast. The present outlook is for a continuance of the same conditions. But while there is no ground for enthusiasm over the immediate prospects, and there are some ominous factors, there is every reason to believe that in the long run the average price for copper will be higher than at present. In the meanwhile producers have reason to congratulate themselves that they are able to keep going at a profit, and are not compelled to sacrifice their output.

Seismic Disturbances and Colliery Explosions

Whatever may be the effect of seismic disturbances upon the outflow of gas in collieries, there can be no question respecting our Scranton contemporary. In its case, however, the emanations are in the nature of choke-damp rather than fire-damp. With the obtuseness of a $10-a-week clerk in a shoe shop, it insists upon our wearing a pair of shoes that do not fit. Our intelligent readers know that we did not indorse the earthquake hypothesis, but simply with a scientific spirit urged that it is worthy of attention.

In this position we rest with a calm that is not to be disturbed. Besides the attention to the subject by scientists that we have already reported, we are able to say that an enlightened foreign government, through its department of mines, has recently made an installation of seismographs in a deep colliery for the purpose of making scientific investigation; and the officers of another government have made application to their superiors for such instruments. Of course, these are things that our monthly contemporary could not be expected to know.

Respecting the meteorological congress recently held at St. Petersburg our authority was a Reuter despatch published in the London *Mining Journal*, Feb. 6, 1909, as follows:

St. Petersburg, Jan. 29—A novel proposal was brought before the Meteorological Congress which has just been sitting in St. Petersburg. It was pointed out that vibrations and oscillations of the ground frequently caused the escape of gas in mines, with fatal results. Several delegates, accordingly, suggested that a seismograph should be installed in every mine to record the least earthquake shock, and thereby warn the engineers of the possibility of danger.

We shall prolong this controversy only sufficiently to state correctly the position of Mr. Spalding, whose article was the inspiration of it. We were under the impression that Mr. Spalding had offered his article to our contemporary, whose supposed rejection we dismissed as immaterial. A recent letter from Mr. Spalding, however, explains that our understanding was not correct, his manuscript having been sent to a friend for criticism and suggestion only, and having been shown by this friend to the editor of our contemporary at the latter's request. Under these circumstances the statement that it had rejected the article displays some obliquity. Even if the article had been actually offered and rejected, the announcement of it would have been a breach of faith. Does our contemporary hope by such action to inspire confidence in future would-be contributors?

The Smelting Report

The 10th annual report of the American Smelting and Refining Company, just issued, is an unsatisfactory fulfillment of the promises to take the stockholders of the company more into the confidence of the directors. Indeed, this report is unfavorable in that respect as compared with previous ones. It is, moreover, not exactly of a nature to inspire enthusiasm as to improvement in the prospects of the company, notwithstanding the rosy statements that were given out in advance. The report does not impress us so favorably as Mr. Guggenheim seemed to think of it.

The gross earnings of the company for the year ended April 30, 1909, decreased about $257,000, as compared with the previous year. Net earnings were made to show a small improvement, obviously by economies in general expense and by trimming the account of repairs and renewals. Net income gained about $332,000, practically all of which was effected by cutting the account of new construction and improvements in halves. In the case of this company, as we have previously pointed out, this account is practically of the nature of an amortization account, and in our opinion has never been adequately allowed for. The further reduction, made last year, is, of course, simply a deferral of operating expenses that will have to be made good at some time in the future.

Nevertheless, in spite of the above

criticisms, it must be recognized that this company has fully demonstrated its ability to maintain large earnings during a period of severe depression, and the earnings will undoubtedly increase materially, not only with the revival of business, but also with the expansion in the mining industry that is bound to go on, just as during the last 10, 20 or 30 years. It is gratifying to observe, moreover, that the American Smelters Securities Company, of which the Smelting company owns 177,510 shares of the common stock, that it has not yet thought wise to include among its inventoried investments, is now showing a large gain in net earnings. The report of the Securities company is so brief and unsatisfactory as to defy analysis.

The End of the Broken Hill Strike

The strike at the Broken Hill Proprietary mines in New South Wales, to which several references have heretofore been made, has been declared off by the union. The men, however, do not return to work. The company is operating its smelting works at Port Pirie, in order to carry out existing contracts for custom and other ores, and in time will bring down some ore from its mines to the smelter, though only a limited quantity. The mines will be operated on a small scale, with a limited number of men; and the same will be the case with the zinc separating and sintering plants. The Block 10 Company, the next largest employer of mining labor, will resume work, but will be no longer under contract with the unions.

In this case the strikers carried their point before the Arbitration Court, and its decision was supported on appeal, but the apparent victory has turned out a practical defeat. The decision of the court could not force the Proprietary Company to operate its mines at a loss, and the greater part of the 2500 men concerned in the strike will be out of employment. Many of them are out permanently, and will have to leave the district.

To sum up the case briefly, it may be recalled that the Broken Hill Proprietary Company three years ago made a voluntary advance in wages. Early this year it asked its men to agree to a reduction to the point prevailing in 1906, on account of the fall in prices of lead and silver; offering as an alternative a sliding scale based on the price of metals. The men appealed to the Arbitration Court, and the company's argument there was that with current prices the mines would be operated at a loss, if the higher wages were continued. The court decided for the men, not on the merits of this contention, but because, in its judgment, the advanced scale represented the lowest "living wage" for which men could be expected to work at Broken Hill. The company has decided to reduce the scale of its operations, chiefly because of the diminished profit, but partly also because its best mines are approaching the end of their life.

In this case the company's offer of a sliding scale seems to have been a fair one. No owner of mining property can be expected or forced to operate it at a loss, and the final result is one that might have been expected.

A Texas Bureau of Economic Geology

The Board of Regents of the University of Texas, at Austin, have established a bureau of economic geology and have called Dr. William B. Phillips, of Birmingham, Ala., to the directorship. He has accepted the position and will take charge of the work in September.

It is the purpose of this bureau to collect and distribute information concerning the mineral resources of the State. It is virtually a resumption of the work of the Geological Survey which was discontinued in 1905, after four years of successful operation, for lack of funds. Dr. Phillips had charge of that survey and is now recalled to continue the work. This is an entirely new departure. There are several institutions where the professors of geology, mining, etc., act also as State geologists, but for the first time in the history of education in this country has a university charged itself with the duty of maintaining at its own expense a special department disconnected from the teaching force for the above mentioned purpose.

Texas is an empire in itself. It has a great variety of mineral resources which should be developed—oil, coal, lignite, asphalt rocks, salt, clays, building and ornamental stones, quicksilver, sulphur, silver, lead, copper, zinc, etc. The State has now a greater railroad mileage than any other in the Union and the development of its resources will surely follow. The new bureau will be of great service, and Doctor Phillips, by long training and former experience, is especially fitted to become its head.

Pig Iron Production

The production of pig iron for the first half of 1909, as estimated by the reports of the furnaces, indicates the gradual recovery of the iron trade from the depression of last year. The total for the six months is 11,024,000 tons, which compares with 6,918,000 tons in the first half of 1908 and with 9,018,000 tons in the second half of last year. Moreover, the actual improvement of 2,000,000 tons does not cover the whole improvement, since some heavy stocks of iron carried over have been absorbed. The quantity of these cannot be exactly determined, but some estimates entitled to respect put them at over 500,000 tons.

The increase in production this year, month by month, has come almost wholly from the stacks owned by the steel companies. The merchant furnaces in blast on July 1 had a capacity about the same as those reporting in January. It is quite probable, however, that this condition will change in the second half of the year. The heavy sales of recent months will go far to reduce the stocks in furnace yards and to relieve the Northern producers from the aggressive competition of the Southern makers of foundry and forge iron.

There is likely to be a larger output in the second than in the first half of the year. The weak point in the present situation is the idle capacity, and the number of furnaces that are ready to go into blast as soon as prices reach a point which will pay them.

ANNOUNCEMENT IS MADE that the eleventh session of the International Geological Congress will not be held until 1910. At the meeting in Mexico in 1906 it was decided to hold the next session in Sweden, and the postponement from 1909 until next year is made to suit the arrangements of the Swedish geologists. The session is expected to be one of unusual interest, owing to the variety of the geology of Scandinavia, and to the series of excursions which are being arranged. Especial attention is to be given at this session to the iron-ore deposits of the world. Professor J. G. Anderson, director of the Geological Survey of Sweden, is the general secretary in charge.

Views, Suggestions and Experiences of Readers

Comments on Questions Arising in Technical Practice and Debatable Points Suggested by Articles in the Journal

CORRESPONDENCE AND DISCUSSION

Pyrite-Zinc Separation

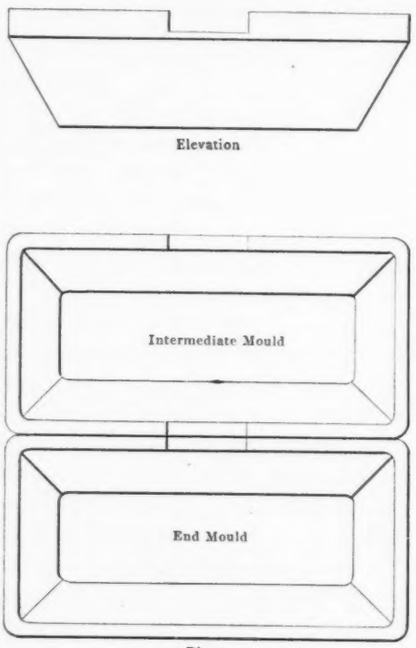
In the JOURNAL of July 3 appears a letter from A. H. Wethey, of Butte, Montana, under date of June 17 which evidences the widespread interest aroused by his article describing the conditions connected with the mining of zinc ores in Butte and published in the JOURNAL of May 1. This interest is sufficient proof that in many localities such complex ores usually known as "refractory," exist in abundance, and are a cross to most operators. Mr. Wethey's letter is not very reassuring to seekers for relief from their troubles, and while with the methods of operation in use at Butte, the secret of success lies in the fact that the ore contains a very small percentage of iron, this has nothing to do, in general, with the possibilities in the treatment of complex ores. The statement may be misleading, and to many will certainly be disappointing, especially reading the continuation as follows: "If the ore here contained much iron pyrite, it would be impossible to concentrate it and bring the zinc product up to 45 per cent. and over." From this it would appear that pyrite-zinc separations are beyond hope, except by the application of some patented process, such as magnetic, static or other device. However, to this statement exception must be taken, since it is not only possible, but practicable to make zinc-pyrite separations by the usually employed concentrating methods when the ore is properly prepared.

Here lies the secret of success. It is not necessary to look for patented processes, but to look to the proper preparation of the pulp before subjecting it to the separating influences, and not to try to do two operations in one, which are mutually incompatible, since founded on opposing principles. We refer to the diametric sizing of ore. With such a feed the capacity of a wet table is not only nearly doubled, but lead-iron-zinc separations follow as a natural result. In this way alone the refractory ore problem can be readily solved, and there is no longer any excuse for a mill, operating on mixed ores, to lose the zinc values or store them as middlings for a future generation to work up.

In several mills recently constructed, such iron-zinc separations are now being successfully made. In one case an ore is being treated which carries 18 to 24 per cent. iron and 22 to 26 per cent. zinc. About 80 per cent. of the zinc is recovered in the form of a concentrate carrying from 46 to 50 per cent. and up to 52 per cent. zinc.

It will not be long before many wet mills treating complex ores will be so modified as to permit them to derive a handsome profit from some of the base values which, in many cases, they now eagerly seek to discard.

It does certainly seem like poor business policy to seek to recover only lead and silver values from an ore and to throw away the zinc and iron, when, as is often the case, the market value of the metallic zinc and of the pyrite exceed that of the lead. Provided only that proper means



The Engineering & Mining Journal, N.Y.

ELEVATION AND PLAN OF MOLDS

(Accompanying communication of John. W. Tudor.)

are employed, there is no reason why a zinc-pyrite separation should not be practicable, regardless of the quantity of pyrite present, so long as the minerals are physically free from each other. There may be some isolated cases where the particles of the various minerals may be so extremely small that in order to effect a freeing of the particles, the added cost for grinding and the added difficulty of separating extreme fines may seriously operate against commercial results; yet in the great majority of cases, the work can readily be done.

CARL F. DIETZ.
DYKE V. KEEDY.

Boston, July 8, 1909.

Matte Tapping Cars

The article by Mr. Havard on the Kilker matte tapping car in the JOURNAL of June 26, reminds me of an improvement introduced while superintendent at the Santa Fé Gold and Copper Mining Company's smelter at San Pedro, N. M., in 1907. In the old form of tapping we had six conventional molds placed side by side on a car and when one mold was full the car was pulled manually until the next mold came under the spout. Of course, there was a great deal of spilling, both by bad judgment as to just when to move the car, resulting in overflow, and by splashing when the matte was falling on the edge of the molds. This occurred for each mold and perhaps 10 to 15 per cent. of the matte had to be remelted. To obviate this, I had a mold made, as in the accompanying sketch, slotted at the sides—the two end molds being slotted on one side only. This formed a continuous channel between the molds when they were set on the car for the matte to run through, on the principle of the sow and pigs of an iron blast-furnace. The result was most satisfactory. By placing the car under the tap with one mold in position, each mold was successively filled without further attention and a minimum of spillage. This had a further advantage. We were producing a high-grade matte, with considerable metallics. Before the introduction of the new mold our metallics were distributed irregularly through the pigs. As the refiners paid a higher price per cent. for the metallics than for the matte it was desirable to get the metallics in a marketable form, and this we were able to do since most of the copper settled to the bottom of the first and second molds where it could easily be separated in pig form from the overlying matte.

There is a slight leakage of matte at the meeting point of the slots in adjacent molds, and a little clay should be applied at these points when setting up the molds. It will be seen that the molds have straight sides corresponding to the depth of the slots. A slight blow with a hammer or bar will readily sever the small bridge of matte between the molds for upsetting, although it generally breaks of itself during the upsetting. The molds, of course, must be upset successively from one end of the car. It will be seen that this is capable of almost infinite extension by increasing the number of molds used according to the amount of matte tapped at one tapping. A slight difference in

elevation of the slots of each mold, the adjacent slots of adjacent molds being, of course, at the same level, will give all the fall necessary. This is not needed in a short run of six molds, provided the slots are deep enough.

The improvement is not patented and I offer it to the profession for such use as can be made of it. The sketch is simply illustrative and does not show the supporting and pivot bars for use on the car.

JOHN W. TUDOR.

Boston, July 6, 1909.

Ownership and Taxation of Mining Claims

Our mining interests need legislation, but A. C. Veatch, of the U. S. Geological Survey, is more radical than wise in the way he has taken to get it. We are individualistic; no nation is more so, and if there are any signs of our having surrendered the freedom of will inherent in individualism for the compulsive authority of collectivism I have not noticed them. State ownership may be preferable, but all of our laws relating to possession—wealth, or land, the source of it—are based on the principle of private ownership, and any and every measure will be overwhelmingly voted down without further consideration the moment a State legislature or Congress discovers it is in conflict with that principle. Vitally important, however, as this is, Mr. Veatch ignores it completely.

In his writings and addresses before Eastern audiences he dwells on and makes much of the fact that mining conditions under the leasing system in Tasmania are prosperous. Being a convert to that theory, he now advocates a policy that is equivalent to the abolition of all private ownership to our own mineral lands and the substitution of the Tasmanian system by the government of the United States. This, in brief, is his proposal, and mining men knowing what the prevailing sentiment is concerning public ownership—especially that of land—should not support it.

Rejecting, however, what I believe to be an impracticable plan for the bettering of mining conditions does not mean that we are without remedy, but we must first know of what we are complaining. Personally, I am in no doubt whatever, either of what must be done, or why, a confidence that I believe is justified by many years' connection with the industry. Speaking, therefore, as one who knows, if I were asked what in my judgment is wrong with the industry with which I have been so long identified, I would say it is the withdrawal of our mineral lands from use. There are in every mining district throughout the West hundreds of mining claims that do not cost their owners $1 to hold year after year, and upon which no work is ever done. And for this the State, not the United States, is responsible. While title rests in the latter an annual outlay of $100 must be made on each claim, and it is to evade making this outlay that a United States patent to the ground is applied for. A company, we will say, has 100 claims, only two of which are producers; but to hold them all there must be an expenditure of $10,000 every year, and as this is sure to become burdensome in a few years, it would in all probability surrender all of its holdings except the paying properties, were there no way of escaping this tax, which amounts to $5 an acre. But there is, and here is where the whole trouble lies. They apply for and are granted a patent and are then subject to the laws of the State, and are thenceforth relieved from making any payments whatsoever; and as often as not are not even assessed a nominal property tax.

Now what should be done is this: If that ground was worth $100 a year before it was patented it must be worth it after the patent is granted, and the State should insist that it is paid. Whatever the jurisdiction, State or United States, the owner of a mining claim should be made pay that $5 an acre tax.

WILLIAM GREENWOOD.

Atolia, Cal., June 26, 1909.

Production of Phosphate Rock in Florida During 1908

BY E. H. SELLARDS*

The first attempts at using Florida phosphate as a fertilizer were made by Dr. A. C. Simmons, of Hawthorne, Fla. Doctor Simmons is said to have recognized the phosphatic character of certain deposits lying near Hawthorne as early as 1879, and to have operated a mill for grinding a phosphatic-pebble conglomerate, for direct application to the soil, as early as 1883. This mill was subsequently abandoned, and the production of phosphate is commonly accepted as dating from the first shipment of river pebble from Peace river in 1888.

The phosphates of Florida are known in the market as hard-rock, land-pebble, and river-pebble phosphate. The plate-rock phosphate now being mined near Anthony is included in this report with the hard rock. The soft phosphates, of which there is a considerable quantity intermixed with other varieties, are unfortunately under existing methods not recovered.

The hard-rock phosphate now being mined occurs along the Gulf side of the Florida peninsula from Suwannee and Columbia counties on the north, to Citrus and Hernando counties on the south. The hard-rock deposits lie in pockets of irregular occurrence and extent and rest usually upon limestones of Vicksburg, lower Oligocene, age. The land-pebble deposits are of Pliocene age and are less irregular in their manner of occurrence than are the rock phosphates. The land-pebble region, at present productive, lies in Polk and Hillsboro counties, to the south of the hard-rock region. River pebble has been obtained chiefly from Peace river and its tributaries.

The production of river pebble increased gradually from the beginning of the industry in 1888, to 1893 when the maximum production of 122,820 tons was reached. From the year 1893 to the present time there has been, with some fluctuations, a decrease in the output of river pebble, the total for 1908 being 32,950 tons. River-pebble mining near Arcadia in De Soto county, which has long been the center of this industry, was discontinued at the close of 1908.

The discovery of hard-rock phosphate was made soon after the beginning of the mining of river pebble. The first shipment of hard rock was probably made in 1890. The output has gradually increased from the beginning of mining to the present time. The total hard rock mined during 1908 was 768,011 long tons, which is a considerable increase over the production of any previous year.

The first shipment of land pebble was probably made in 1891, although development began somewhat earlier. In 1892 the production according to the statistics of the United States Geological Survey amounted to 21,915 tons. The rate of increase in the production of land pebble was at first gradual, but in late years has been very rapid. In 1896 the output of land pebble for the first time exceeded that of hard rock. The amount of land pebble mined during 1908 is greatly in excess of that mined during any previous year, amounting to not less than 1,150,000 long tons.

The total amount of phosphate mined in Florida during 1908 was 1,950,961 long tons. The limit of error in this total is slight and is concerned chiefly with land pebble, the production of which may vary slightly from the amount calculated. The total amount of phosphates on hand at the close of 1908 was exceptionally large, and mining operations during 1909 will undoubtedly be curtailed.

Practically all of the hard-rock phosphate produced in Florida is exported, the home consumption of this grade being insignificant. During 1908 only 9900 tons of hard rock was consigned for use in the United States and 6000 tons of this is reported as used in Florida. The river pebble, although not used in Florida, is used entirely within the United States, no part of the 1908 output having been exported. Of the land pebble 150,377 tons is reported as having been consigned for use in Florida. The remainder of the total amount shipped was approximately equally divided between domestic and foreign ports.

*State geologist, Tallahassee, Fla.

The Ore Concentration Company (1905)

The third ordinary meeting of this company was held June 30 in London, when information was given by Stanley Elmore on the operation of the Elmore concentrating plants and on the position of the company, as regards litigation, with the Minerals Separation Company, which owns a rival process. The ore concentration company has won its case against the Minerals Separation, Ltd., in England, in the lower court and in the court of appeal. The case, however, is to go to a still higher court, the House of Lords.

The cross-action by the Minerals Separation, Ltd., in England, based on the Froment patent, has been withdrawn with payment of costs. In Germany the company has been successful in its opposition to the grant of a patent to the Minerals Separation, Ltd., and no patent will be allowed that company. The most important case to be tried in connection with patent rights is that instituted in Australia against the Sulphide Corporation, which is said to have been using the Minerals Separation process for some two years and to have treated some 500,000 tons. A very heavy claim for damages is being made by the Ore Concentration Company. But whether it wins or not, Mr. Elmore considers it merely an important side issue and that in other directions the prospects of the company are quite satisfactory and encouraging.

The largest Elmore plant at work is that of the Zinc Corporation at Broken Hill, N. S. W., where the plant is now treating 19,600 tons per month, producing 8000 tons of concentrates.

The accounts do not include a profit-and-loss account, but the balance sheet shows that about £4000 were received during the year from royalties, testing fees, interest, etc., so that it is clear that the company's business is not yet established on an extensive or lucrative scale, whatever may be in store for it in the future when lawsuits with other patent processes are out of the way. The issued capital of the company is 224,544 shares of £1 each, and the net expenditure to Dec. 31, 1908, on testing development and administration, less royalties and fees is £18,880 in all.

The Alabama Mining School

SPECIAL CORRESPONDENCE

The University of Alabama, situated at Tuscaloosa, is just completing a fine engineering building to be called Conner Hall, in honor of the governor of the State. This building is constructed of Indiana sandstone and St. Louis drab-colored brick and has two acres of floor space. In the center of the building are experimental coal and ore washers. Adjacent to these are boiler and gas producer rooms. There are 2 water-tube boilers, 1 equipped with Burke furnaces and the other with automatic underfeed stokers. These boilers will heat the buildings in addition to furnishing steam for machine and woodworking shops and a Corliss engine operating a 150-kw. alternating-current generator. The gas producer furnishes gas to operate a gas engine operating a 45-kw. direct-current generator. These in turn operate various machines in the different shops and laboratories. The machine shop is well supplied with tools; also the wood-working shop. The electrical laboratory is to be well equipped for electrical experiments and the physical laboratory will be supplied with various machines for testing strength of materials. The building contains spacious lecture and recitation rooms, drafting room, an engineering library and instrument room. This building is in charge of Professor Edmund Kay, and will be ready for use by the fall session.

There is also under construction another building about half the size of the former, and of the same material, called Smith Hall, in honor of Dr. Eugene A. Smith, State geologist. This building will be given over to Biology and Geology under Dr. Smith's direction, and will be the headquarters of the Alabama Geological Survey.

These additions place the University of Alabama in the front rank of Southern colleges and will be of great value to the State, not only from an educational standpoint, but as a testing laboratory for the mining, metallurgical, mechanical and electrical industries.

Process of Smelting Zinc Ores

Anson G. Betts has patented (U. S. Pat. 918,648, April 20, 1909) a process for smelting zinc ores, based on the reduction of zinc oxide by silicon and its alloys, and also alloys or carbides of aluminum, calcium and magnesium. With silicon as the principal reducing agent the process is as follows: The ore either before or after roasting is mixed with silicon or a silicon alloy in a sufficient quantity to reduce the contained oxides of zinc, copper, lead and iron. The mixture is heated in a reverberatory furnace to a temperature below that at which the reduction of zinc takes place. The heated mixture is then passed into a highly heated furnace where the reaction commences. The heat of the reaction is so great that the amount of heat required to maintain the smelting temperature in the furnace is small. The slag is tapped off and the distilled zinc is condensed in a suitable condenser.

Mechanical Peculiarities

BY D. E. WOODBRIDGE*

Traveling through mining districts one frequently runs across oddities of construction. The following, which I noted in the Southwest, are remarkable examples of "mechanical genius." They were installed at a prospect situated in the mountains 17 miles from a railroad; the shaft was 100 ft. deep on the incline.

The superintendent could not find a hoist that suited him, so he prepared drawings that were submitted to a foundry and machine shop at his home town, about 2500 miles from the mine, in a region where they had no occasion to handle mine machinery, and knew nothing about it. This hoist consists of an 8x12-ft. cylindrical grooved drum mounted rigidly on the shaft, which extends at one end 12 in. beyond the main bearings. Upon this extension is mounted a bevel

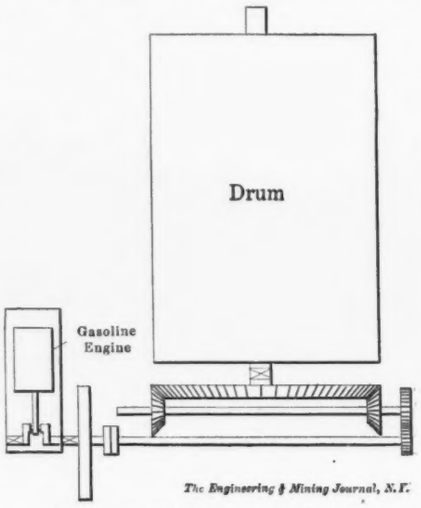


FIG. 1. PLAN OF THE SPECIALLY DESIGNED HOIST

gear 8 ft. in diameter. Parallel with the drum and within 3 ft. of it is a 25-h.p. gasolene engine of a very early Pacific-coast type. To the crank shaft of the engine is attached a friction clutch that engages a shaft running at right angles to the drum and across its end. Upon the far extreme end of this shaft, which is about 13 ft. long, is a spur gear engaging a smaller gear on a parallel shaft. On this latter shaft are two bevel gears operating the bevel mounted on the drum shaft. The accompanying rough sketch, Fig. 1, illustrates the construction. The entire outfit is mounted on a timber frame. The drum is grooved for 3600 ft. of rope. This drum was designed and cast in three 4-ft. sections, each section containing rim, spider and shaft, but it was assembled and hauled to the property as one piece.

Fig. 2 shows another hoist brought in at the same time, for what purpose no one

*Mining engineer. Duluth, Minn.

is able to determine. It resembles the kind formerly used at the top of old-fashioned blast furnaces. This one is designed to be run by belting, the pulley shaft, which ends in a worm gear, engaging a spur gear attached to the shaft of the drum. There is an eccentric device for automatically throwing the belts. That which in the illustration appears to be a cylinder head incloses the worm gear, and the circular box below it surrounds the spur. The proportionate sizes of these give an idea of the speed at which the drum could be revolved—if at all.

The same superintendent also designed a skip, shown in Fig. 3. It consists of a steel barrel 6 ft. high and 4 ft. in diameter (originally it was built 9 ft. high), with a gate in one side for the discharge of material, and equipped with four pairs of small wheels, two on each side, each pair set with ½ in. clearance. Steel plates 20 ft. long, 6 in. wide and ½ in. thick were bolted to timbers on the sides of the mine

FIG. 2. WORM-GEAR HOIST

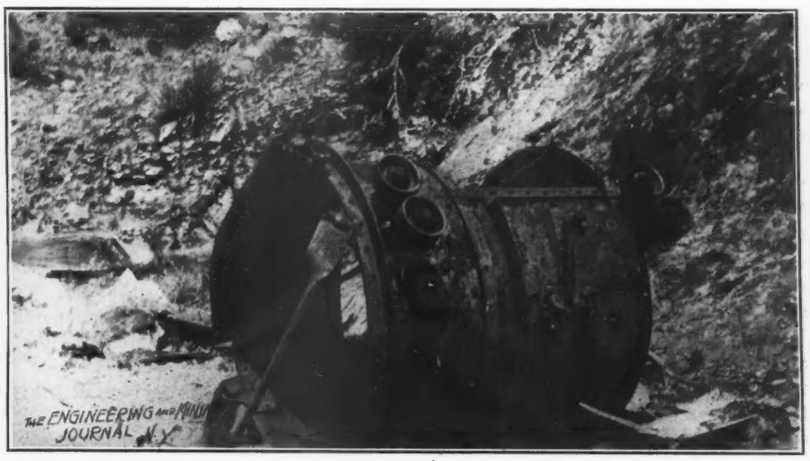


FIG. 3. SIDE-DUMPING BUCKET SKIP

shaft, and the barrel was hung in the shaft between these plates which formed a track between each pair of wheels. Needless to say, this skip was used but once. On that memorable occasion it stuck in the shaft and the services of the engine, a heavy winch and many men were required to get it out again. It was expected that this skip would be used for hoisting material taken out in sinking, but as it could not be lowered beyond the timbering, or until steel tracks 20 ft. long had been bolted to the sides of the shaft, and as it was originally built 9 ft. high, there might be occasions when the opening in the skip would be 30 or 40 ft. above the muckers in the bottom of the shaft!

Other parts of the plant at this mine, such as underground dump cars of the blast-furnace charging-barrow type are as curious as those described, but the main features have been covered. I know of no more interesting mine equipment anywhere, unless it be that old one of the Ray Consolidated, Arizona, where the former English management hitched 13 gasolene engines of diverse types and different speeds and horsepowers to one main line of mill shafting.

Transportation of Explosives

As a further step toward adding to the safety of railroad operations, the lines comprising the American Railway Association operating 246,172 miles of line in the United States, Canada and Mexico have, beginning July 1, 1909, put into effect revised rules for the transportation of inflammable articles and acids. These are supplementary to the rules of the Interstate Commerce Commission, effective April 13, 1909, for the transportation of explosives. These regulations for the transportation of dangerous articles have been formulated by Col. B. W. Dunn, U. S. A., chief inspector of the Bureau for the Safe Transportation of Explosives for the American Railway Association, and are based upon an act of Congress approved May 30, 1908, and they are designed to emphasize the dual responsibility in the interest of public safety, that rests upon the shipper and the carrier.

The particular purpose is that the shipper shall know the true characteristics of his shipment and familiarize himself with the requirements of the regulations in order that he may inform the carrier by use of prescribed certificates and labels. The thoroughness with which this campaign for safety has been pursued may be indicated by the fact that special supervision is given not only to the transportation of powder, dynamite and other heavy explosives, but it is now provided that special care shall be pursued in the handling of any material that gives off inflammable vapor at or below a temperature of 80 deg. F.; materials subject to spontaneous combustion; materials other than acids, that are liable to cause accidents by friction, concussion, absorption of moisture, contact with organic matter and otherwise. Special rules also govern the handling of compressed gases, as well as a list of eight of the more virulent acids and corrosive compounds. Illustrative of the detailed care with which the various rules have been formulated to govern the packing of different articles, are the following regulations:

"Nitro-cellulose wet with solvent must contain not less than 30 per cent. of a solvent whose flash point is not less than 40 deg. F.; and must be packed in strong, tinned or galvanized iron vessels, of the milk-can type, with a satisfactory means for keeping them securely closed.

"Metallic sodium or potassium, in quantity not greater than 1 lb., must be placed in neutral oil, and this in a well stoppered bottle protected by a tin box, or these substances may be packed in a hermetically sealed tin cylinder."

It is stipulated that every article of a hazardous character, when offered for shipment, must bear a prescribed red label to indicate to the railroad employees the method of handling.

An important new development in American mining practice is the substitution of compressed air for steam in large surface hoisting plants. The new system is being developed by the Nordberg Manufacturing Company, of Milwaukee, Wis. The only change that has to be made in existing hoisting engines is in their cylinders. The new system of hoisting by compressed air is to be adopted by the Amalgamated Copper Company, at Butte, Mont., and by the Miami Copper Company at Globe, Ariz. The object of the change is simply increased economy. At Butte the mines will be able to take advantage of comparatively cheap hydro-electric power. At the Miami mine the power will be developed originally in a steam plant, from which it will be transmitted electrically to the hoisting engines, the economy in this case being due to the greater efficiency of a large central steam plant.

American Smelting and Refining Company

The annual report of this company for the year ended April 30, 1909, shows little change in the balance sheet. The capital stock remains at $100,000,000; the bonded debt is $237,000, a decrease of $112,000 during the year. A comparative statement of the income account is as follows:

	1907-8.	1908-9.	Changes.
Net earnings....	$ 9,403,282	$ 9,146,387	D. $ 256,895
Gen. exp. & taxes	$ 836,866	$ 637,335	D. $ 199,531
Repairs, etc.....	933,129	797,073	D. 136,056
Total charges.	$ 1,769,995	$ 1,434,408	D. $ 335,587
Surplus.....	$ 7,633,287	$ 7,711,979	I. $ 78,692
Profit sharing fund.....	.....	$ 47,695	I. $ 47,695
New constr'tion	$ 622,097	321,234	D. 300,863
Dividends.....	7,000,000	5,500,000	D. 1,500,000
Total approp..	$ 7,622,097	$ 5,868,929	I. $1,753,168
Balance.....	$ 11,190	$ 1,843,050	I. $1,831,860
Bal. from prev. year.....	13,397,028	13,408,218	I. 11,190
Total surplus.	$13,408,218	$15,251,268	I. $1,843,050

Ordinary repairs and improvements were cut down considerably. Dividends were reduced by the lower payment on the common stock. The report says:

"Attention is specially called to the fact, that, notwithstanding business operations in general during the period covered by this report were markedly depressed, and corporation earnings almost universally declined from the preceding year, yet after paying quarterly dividends, amounting to 7 per cent. on the preferred stock and 4 per cent. on the common stock, there has been carried to surplus account for the year $1,843,050. This increase of surplus is largely shown in the increase of cash and demand loans amounting to $1,730,205 in all.

"All expenditures on the plants of the company, on account of repairs and betterments, as well as improvements and new construction, have been, as usual, charged to profit and loss account and every necessary expenditure has been made to improve the efficiency of the plants and their ability to operate economically. It will be noted that expenditures for new construction and improvements were $300,862 less than the previous year

"There is inclosed with this report a copy of the fourth annual report of the American Smelters' Securities Company. Your company owns 177,510 shares of the common stock of that company of the par value of $17,751,000. This, being the majority of the common stock, places your company in control of the Securities company, and it has always been believed by your directors that this asset would in time prove to be of very great value. As yet, it has not been thought wise to include this asset among the inventoried investments of the company, but the successful development of the Securities company has had the most earnest and careful thought on the part of the officers and directors of your company. The success of the past year has been most encouraging and leads us to expect the fulfilment of all of the hopes of the past. At the time of the organization of the American Smelters' Securities Company it was believed that your company would be obliged to advance, under its guarantee, some portion of the dividends accruing on the series B stock until the Securities company was able to fully operate its projected smelting plants. Your company, however, has not been obliged to make any advances on account of such dividends.

"The statement so frequently made that the Smelting company and the Securities company would give a good account of themselves in times of depression has been fully justified.

"Under the requirements of the mortgage, the outstanding bonds issued by the Omaha & Grant Smelting Company, maturing in 1911, have been reduced by the sum of $112,000, leaving $237,000 now outstanding."

The German Potash Syndicate

A despatch from Berlin, Germany, July 8, says: "The attempt by American fertilizer interests to break the German potash monopoly has failed. The German trust, after having its life endangered for a week was renewed tonight for five years.

"This means that America, which is the heaviest foreign consumer of German potash, will have to continue, as in the past, to buy of the syndicate at syndicate prices. The Americans, however, succeeded in making contracts for a heavy supply of potash below the syndicate price while the fate of the syndicate hung in the balance. The contracts for this supply have been taken over by the syndicate, which will make deliveries at the contract price, the difference being borne by the Sollstedt mine, which made the sale.

"The Americans, therefore, have secured only a temporary relief. The Sollstedt mine, which entered into negotiations with the Americans, was frightened back into the syndicate by Government threats of a prohibitive export duty on potash."

It now appears probable that the American interest which was reported in the despatches published last week to have bought the Sollstedt mines—the identity of which was not then made clear—was the syndicate generally known as the independent fertilizer combination. This was much discussed a few months ago, but its formation, it was supposed, had been postponed for the present. This, however, seems to have been done largely for the purpose of keeping quiet the negotiations for the German potash property. The full organization of the new trust has now been announced, its name being the International Agricultural Corporation. So far as the supply of potash salts is concerned, the company will now be on an equality with the other large interest, which had previously held an advantage through its contracts.

The American Smelters' Securities Company

The first published report of this company is issued with that of the American Smelting and Refining Company, and covers the year ended May 31, 1909. The balance sheet shows capital stock, $77,000,000; current liabilities, $6,418,999; unearned treatment charges, $1,548,921; deferred liabilities, $2,557,360; surplus, $554,752; total liabilities, $88,080,032. The assets include property, $78,846,677; metal stocks, $6,964,093; material on hand, $984,527; cash, $1,285,335; total assets $88,080,032. The income account for the year is as follows:

Net earnings.....	$5,430,066
Interest, taxes and general expenses.	$1,112,261
Ordinary repairs and betterments...	691,379
Total charges.....	$1,803,640
Surplus for the year.....	$3,626,426
New construction and improvements.	$585,384
Dividends on A and B preferred stock.	2,520,000
Total appropriations.....	$3,105,384
Net surplus.....	$521,042

Adding $33,710 brought forward from previous year, made a total surplus of $554,752. The report says:

"The general condition of mining and smelting business during the past year has been encouraging, but not equal in volume to the years immediately preceding when the price of metals was considerably higher; nevertheless the net earnings of the company amounted to $3,626,426 in comparison with earnings of the preceding year amounting to $1,536,965. Projected new construction has been nearly completed at your plants and mining properties have kept in excellent repair and are doing efficient and economical work. To this end, expenditures for ordinary repairs, betterments, new construction and improvements charged to profit and loss have amounted to $1,276,762 in all.

"Regular quarterly dividends have been paid, amounting to 6 per cent. on the preferred A stock, and 5 per cent. on the preferred B stock, and the surplus account for the year amounts to $521,042. It is encouraging to note, also, that the earnings above reported for the twelve months' period were divided as follows: For the first six months, $1,318,146; for the last six months, $2,308,280.

"Although the Securities Company, when first started, consisted almost en-

tirely of mining properties, the stockholders will doubtless be interested to know that for the past year more than two-thirds of the profit of the company was made at its various smelting plants. This ratio is likely to increase for the future.

"The production of copper from mines and smelters of your company has so largely increased that the directors believed it advisable to build or purchase a copper refinery. They were able to effect a purchase by contract of the stock of the Baltimore Copper Smelting and Rolling Company, representing the oldest electrolytic copper refining plant in the United States. This contract requires semi-annual payments continuing until Jan. 1, 1916, and the deferred liabilities on account of this contract now amount to $2,553,360. The profits of the plant accruing to this company undoubtedly will continue to be more than sufficient to pay the instalments with interest. Your directors believe that this contract was a most advantageous one for obvious reasons."

Stratton's Independence, Limited

In the course of a speech made before a recent meeting of stockholders of Stratton's Independence, Ltd. (mines and mill at Victor, Colo.), the chairman of the company said in part:

"You will have noted that the whole of the new company's capital was applied for and allotted, thus providing the £50,000 working capital which it was proposed to raise by means of the assessment of 1s. per share under the reconstruction scheme. We are informed by cable received from the consulting engineer that the general outlook of both mine and mill is good. During the 10½ months to April 30 last, 14,060 tons of ore were produced, of an average value of 25¼ dwt. per ton, from which was derived a new working profit to the company at the mine of $54,915. From this amount funds were provided amounting to $11,250 for new development work totalling 1100 yd. So much for the records of the mine department up to the date mentioned.

"With regard to the new mill, it will be remembered that there are two departments—namely, one, the wet mill, for treating the dump ore formerly deposited at the surface, the other, the dry crushing mill, for dealing with the low-grade ore from the mine, and incidentally the rich ore produced by the lessees, and also the rich concentrate from the wet mill. With regard to the first, the main objective the directors had in view in the construction of the mill was the treatment of the dump ore, and this may be regarded as quite satisfactory, although, owing to the short time during which it has been running, it is too soon to obtain a complete clean-up. Judging from the results for the months of April and May, Mr. Argall's original anticipations as to the successful and profitable treatment of the dump should be realized in the immediate future. During the month of April, 3100 tons of dump ore were milled. The production in concentrate therefrom amounted to 91 tons, containing 173 oz. of gold, or nearly 2 oz. to the ton which Mr. Argall rightly describes as most satisfactory. In addition, there remained the gold to be cleaned up in the cyanide department, concerning which he wrote it was getting down to good work for higher extraction and lower cost. Four thousand tons of dump ore were put through the mill during May, and the rate of extraction is now quite satisfactory, so that after cleaning up on July 1 next, Mr. Argall hopes to be able to advise the directors to increase the dump milling capacity to 6500 tons per month. From those remarks I think it is only fair to expect that we may soon see the first unit of the dump mill working on full capacity as originally estimated—namely, 5000 tons per month—with an addition of 1500 tons in the second unit at a profit of $1 per ton; and in this connection it is an encouraging feature that the 3100 tons milled during April averaged $4.30 per ton, the estimated profit of $1 per ton having been calculated on an average of $3.70."

The Dry Mill

"I am sorry to say that I have not such a good account to give concerning the dry crushing mill as for the dump mill. After getting everything ready to start, 1500 tons of ore from the mine, averaging $7.36 per ton, were put through this mill during January and February last. The conditions were adverse, in consequence of defects which developed in the joints on one side of the roasting furnace. In the repairs which were rendered necessary, coupled with the loss which was due to the unsatisfactory nature of the mill run, owing to the mechanical defects described, an expenditure was incurred of $6222. The working of this dry mill has not yet been resumed at present, for two reasons. In the first place, the caved area (the 100- and 200-ft. levels) was found to be more badly crushed than was anticipated; consequently, more work must be done in opening out drifts and crosscuts to get at the low-grade ore lying in these workings. On the other hand, so many men are employed on surface deposits and on outcrops of the veins that the authorities deemed it unsafe to continue the workings in the caved area, so that operations at one or the other of these points had to be restricted, and Mr. Argall has decided to suspend most of the low-grade ore extraction in the caved area for the present. Meantime, workings in other parts of the mine will be pushed forward to reach additional sources of supply which have not yet been tapped effectively. Some little time will, therefore, elapse before an adequate accumulation of low-grade ore can be obtained for the purpose of resuming the treatment of this ore on a sufficient scale in the dry crushing mill. Mr. Argall has cabled this week that the estimated profit for the month is $10,000, or over £2000. One of the most hopeful features of the company is the striking of pay ore at the 700-ft. level in the granite area. The ore was followed down in a winze below the 300-ft. level; that ore was again struck at the 500-ft. level, and now comes the news of a discovery on the 700-ft. level, pay ore having been struck on the vein in three different places, covering an extent of nearly 400 ft. of vein. A stope 35 ft. long is being worked on this new discovery."

Lead Mining at Laurium, Greece

Mining operations at Laurium were reduced to such an extent in 1908 that there are signs that mining is rapidly becoming a decaying industry. The vast metalliferous area formerly providing work for more than 15,000 men employs at present only 4500, who are principally occupied in the output of lead and zinc ore. The production of lead in 1908 by the two smelteries was 14,322 tons, one lot of 7822 tons, belonging to the French company, containing 1500 grams of silver, and another lot of 6500 tons, belonging to the Greek company, 1625 grams. A second water-jacket furnace, on the American system, is now in course of construction, capable of producing 30 tons of lead per day, which should increase the annual yield of metallic lead, and reduce the cost of smelting.

Correction

The illustrations of the Mount Elliott and Mount Cuthbert copper mines used in connection with the article on the "Wallaroo and Moonta Mines and Smeltery" in the Journal of July 10, 1909, do not belong with that group of South Australian mines, but are in the Cloncurry district in Queensland. The photographs were received with the Wallaroo & Moonta illustrations and, in the absence of other designation, were inadvertently used and credited to that group.

The oil refinery of the Waters-Pierce Oil Company in Mexico is situated on the north bank of the Panuco river, between Tampico and the sea. The plant now has 10 stills in operation, capable of treating 1200 bbl. of crude oil per day. The crude oil comes from the Ebano oilfields, on the line of railway about 60 miles west of Tampico, and also from the United States, whence it is shipped to Tampico in tank steamers. There are about 250 workmen, mostly Mexicans, constantly employed at this refinery.

Personal

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

S. E. Bretherton has been in Nevada on professional business, returning about July 10 to San Francisco.

J. V. Bohn has gone to Tennessee as general superintendent of mines for the Tennessee Copper Company.

Frank Graham, of Silver Plume, Colo., has gone to Rye, Colo., to accept a position as manager of a zinc property.

C. T. Arkins sailed for Valdez, Alaska, July 8 for a trip of three weeks, returning to Chicago at the end of that time.

Etienne A. Ritter, recently appointed general manager of the Evergreen Gold and Copper Mines Company, is remodeling the Evergreen concentrating mill at Apex, Colorado.

I. W. Guthrie, of Pittsburg, Penn., president of the Republic Iron and Steel Company, has been in Birmingham, Ala., for a few days past, on business connected with his company.

C. S. Herzig, who has been in Nicaragua for the last year in behalf of the Oroya-Brownhill Company, which has purchased a mine there, was in New York this week, on his way to London.

C. H. Rogers, an English mining engineer, who has had experience in Australia and South Africa, has taken charge of the development of the Welsh claims, Gowganda, Ontario.

D. E. Richie, of Columbus, O., has been appointed superintendent of the Blocton division of the Tennessee Coal, Iron and Railroad Company, with headquarters at Blocton, Ala., to succeed F. H. Gafford, resigned.

W. H. MacMahon, chemist of the Oliver Mining Company, at Virginia, Minn., has accepted a similar position with the Republic Iron and Steel Company, and is stationed at the Kinney mine, near Buhl, Minnesota.

P. W. Malloy, of Alderson, Okla., was appointed superintendent of the Alderson division of the Rock Island Coal Mining Company, on July 1, relieving H. C. Booth, who will now confine his attention to the Hartshorne division of the same company.

W. H. Trewartha-James, general manager of the Tyee Copper Company, recently returned to Victoria, B. C., from a visit to the Hidden Creek copper mine, Goose bay, Observatory inlet, near southeast Alaska. He was accompanied north by M. K. Rodgers, of Seattle, Wash., one of the owners of the mine.

Marshall D. Draper, who has been general manager for the Fifty Gold Mines Corporation at Black Hawk, Colo., during the past year, has resigned and will devote his entire time to the financing and management of the cyanide plant to be built at Black Hawk, Colo., for the treatment of heavy iron sulphide ores.

R. H. Morris, chief engineer of the Mexican Coal and Coke Company at Las Esperansas, Coahuila, Mexico, resigned his position July 1, and on July 8, accepted a similar position with the Tennessee Coal, Iron and Railroad Company, with headquarters at Birmingham, Ala., succeeding Robert Hamilton, who has been appointed consulting engineer.

F. B. Keiser, of Thomas, Ala., has resigned his position as general superintendent of Thomas Furnaces of the Republic Iron and Steel Company, to accept a similar position with the Southern Steel and Iron Company, recently reorganized, with headquarters at Birmingham, Ala. Mr. Keiser is succeeded at Thomas by Joseph E. Johnson, Jr. Mr. Keiser has been in charge of Thomas furnaces ever since they were built some 20 years ago, by the Thomas Iron Company, of Pennsylvania. Mr. Johnson is a brother of Guy R. Johnson, of Birmingham, vice-president and general manager of the Alabama Consolidated Coal and Iron Company. The change is effective July 15.

Obituary

George W. Jacques, for many years in the metal business in New York, and one of the oldest members of the Metal Exchange, died suddenly on July 8, while attending a meeting of the board of managers.

Henry C. Hicks, who died in Brooklyn, N. Y., July 7, aged 66 years, was for over 20 years connected with the Consolidation Coal Company, of Maryland. He retired from active business four years ago.

James Stirling died in Riverside, Cal., June 26, aged 57 years. He was formerly government geologist of Victoria, Australia. For several years he was the mining representative of that colony in London. For the past four years he had been engaged in examining and reporting on mining properties in California, Nevada and Arizona.

M. M. Kuffner, superintendent of the Davis Creek Coal Company at Davis Creek, Ala., was killed in the mine July 6. A trip of tram cars broke loose from the cable and rushed back into the mine. Mr. Kuffner was inspecting some pumps in the bottom of the mine and was struck by the runaway cars. His neck was broken and death followed a few moments later. Mr. Kuffner was formerly assistant State mine inspector. He was well versed in mining and had brought the Davis Creek mines up to a fine standard.

Robert Dunn Rhodes died June 25 at Los Angeles, Cal., where he had gone for his health; he was 56 years old. He was born in Quebec, but came to the United States when a boy, and graduated from the School of Mines of Columbia University. Soon afterward he went to the West, securing a position as mining engineer. He was connected for many years with some of the largest mining companies in this country, Mexico and South America, and held heavy personal interests in all of those countries. He was well known in Utah and California. When he first went to Utah he was connected with the Ontario mill and later with the Germania smelter. Mr. Rhodes was associated in his earlier years with his brother, Frank Rhodes, also a metallurgical engineer. Mr. Rhodes traveled extensively throughout Mexico, examining and reporting on some large mining properties. He returned to Utah about seven years ago and built the Murray smelter. He afterward accepted an engineering position with the American Smelting and Refining Company, and was prominently identified with the Guggenheim interests for several years. He built the Mammoth smelter in Shasta county, Cal., six years ago. For many years before his death he was general superintendent of the smelting plant at Bingham Junction, Utah, owned by the United States Smelting, Refining and Mining Company.

Societies and Technical Schools

Alabama Coal Operation Association—On July 17, the association will hold an all-day meeting at East Lake park, near Birmingham, composed of members of the association, superintendents, engineers mine foremen, gas men, etc., for the purpose of discussing the question of greater safety in and about coal mines. A recess of one hour will be taken, at noon, during which time a barbacue will be served. The program will be as follows:

1—Introductory remarks by Chairman George B. McCormack, president Pratt Consolidated Coal Company.

2—Lecture and demonstration on First Aid to the Injuried, by Dr. M. J. Shields, Scranton, Penn., who is connected with the United States Army Hospital Corps, and who has been engaged for some time in the organization of first aid corps in the anthracite mines of Pennsylvania.

3—Discussion by Dr. R. M. Cunningham of Ensley, Ala., and others.

4—Addresses by chief State mine inspector Edward Flynn, and assistant inspectors James Hillhouse and Robert Neill.

5—Remarks by Guy R. Johnson, chairman of the Mines and Casualty Committee of the association, and vice-president of the Alabama Consolidated Coal and Iron Company.

6—Paper on "Prevention of Accidents in Coal Mines," by Edward H. Coxe, of Birmingham, Ala., general superintendent of coal mines and coke ovens, of the Tennessee Coal, Iron and Railroad Company.

7—Short talks by superintendents, mine foremen, and others.

Special Correspondence from Mining Centers

News of the Industry Reported by Special Representatives at Butte, Denver, Salt Lake City, Goldfield, Colbalt and London

REVIEWS OF IMPORTANT EVENTS

Butte

July 8—The United States assay office at Helena, in its report for June states that $166,925 in bullion was received during the month. This is a gain of $47,946 over the same month a year ago. In this production Madison county is first with $55,646; Chouteau county is second with $54,511; Fergus county is third with $46,977, and Lewis and Clark county fourth with $1809.

Oscar Rohn, of Butte, has been appointed receiver for the Pittsburg & Montana Copper Company on application of the Union Trust Company, of Pittsburg. The company was originally headed by Ralph Baggaley, and the reduction works were built with the intention of utilizing the Baggaley process for the treatment of copper ores. After failure to obtain satisfactory results the smelter was changed to operate in the usual way. The application for the receivership is simply a friendly suit instituted to wind up the affairs of the Pittsburg & Montana Company so that a clear title to the property may be acquired by the Pittsmont Copper Company, which already controls it. The Pittsmont company is in turn owned by the East Butte Copper Company.

Notice has been filed with the clerk of the United States court at Helena that an appeal is to be taken in the action of Bliss vs. the Washoe company, generally known as the smoke case. The farmers of Deer Lodge valley had asked for the closing of the smelting plant at Anaconda on the alleged ground that gases ruined vegetation, but the injunction was denied; hence the appeal.

Master in Chancery Crane, of the Federal Circuit Court, is in Butte hearing evidence in the case of the South Butte Mining Company *vs.* T. D. Thomas. The suit involves the title to the Surprise lode claim near Butte, and is based upon the question of whether the placer location made in 1881 includes the lode alleged to exist in the property. Defendant Thomas maintains that the vein being known at the time of the placer location, the patent to the placer did not include the lode on which the quartz location was made.

The June output of the Butte mines is estimated to have aggregated 25,187,780 lb. of fine copper, as compared with a May production of 26,443,244 lb. and an output a year ago of 13,159,000 lb. Last year's small production was due to a serious interruption of operations by floods. The total output of the district for the first half of the current year is given as approximately 156,430,284 lb. as against 101,373,320 lb. for the corresponding period in 1908.

Denver

July 9—At Red Mountain, in the San Juan region, the Carbon Lake mine, of the San Antonio company, is shipping a carload of enargite ore of a value of $25 per ton. The Treasury tunnel, whose portal is about one-quarter mile north of the town of Red Mountain, has been working all winter, and is still pushing ahead with about 10 men and machine drills, its objective point being the intersection at great depth of the Tom Boy and other rich gold veins of Savage basin in the Telluride district. At Silverton it is stated that the Gold King mine, the buildings of which were burned in May, is to start up again, and that when running at full capacity 200 men will be employed.

In the Cripple Creek district, at a meeting of the Doctor-Jack Pot Mining Company a dividend of ½c. per share was declared, payable Sept. 1, amounting to $15,000. They have also authorized the purchase and installation of a 10-drill compressor. The ore output of the Gold Dollar company for last month had a bullion value of $16,500. The output of the Jerry Johnson mine, on Ironclad hill, averaged 40 tons per diem during June. The deep drainage tunnel is now in about 10,000 ft., and is being driven in hard granite at the rate of about 11 ft. per day. The British-American company, leasing on the Dante, shipped upward of 700 tons of 1-oz. gold ore during June; the Findley output is given at 2000 tons of 1-oz. ore.

The Portland Gold Mining Company has reduced its quarterly dividend to 2c. per share, or $60,000. This is $30,000 less than the last dividend paid, and the officers of the company state that this action has been taken on account of the great outlay to be incurred in building the new mill, work on which has now been commenced.

The Vindicator Consolidated Gold Mining Company has declared a dividend of 1½c. per share amounting to $22,500 and payable July 25. This makes a total of $2,002,500 of dividends paid to date by this company.

The Colorado & Southern railway, which taps the Gilpin county pitchblende and carnotite producing district, has agreed to haul these ores free to the State School of Mines at Golden, where a series of tests are to be made with a view to the production of radium.

After repeated experiments and tests made in a 10-ton experimental plant, Marshall D. Draper and P. R. Alsdorf, of Central City, have determined that the Gilpin county ores are amenable to treatment by cyaniding and have had their tests checked up by several of the leading cyanide men of the State. Local and outside capital has become interested and steps will be taken to erect a 300-ton cyanide plant, including sampler, at an estimated cost of approximately $200,000. The plant is to be built at Blackhawk. Messrs. Draper and Alsdorf claim that they will be able to treat iron sulphide ores of the district at a profit. On account of a heavy cloudburst on July 4, several miles of track were washed out on the Colorado & Southern road as well as several miles being covered over with sand and rocks, delaying traffic on that branch for a period of about ten days and interfering with the shipments of Gilpin county ores to smelters, as well as with the receipts of coal for mining and milling purposes. So far, however, regular operations at mines and mills have been maintained.

Salt Lake City

July 9—Dividends aggregating $210,000 will be posted this week by three Tintic companies. The Colorado and the Iron Blossom will pay 8c. per share as heretofore and the Sioux Consolidated will pay 7c. per share. The foundations have been completed for the two main buildings of the International Smelting and Refining Company's new smelting plant at Tooele and the erection of the steel framework is under way.

The last unit of the big mill of the Boston Consolidated company at Garfield was placed in commission during the early part of July, and the plant is now running to full capacity. The entire 13 units of the mill could have been placed in operation some time ago, but the mine has not been in shape to supply the tonnage. While the rated capacity of the mill is 2500 tons per day, A. J. Bettles, who designed the mill, is quoted as saying that when some further adjustments are made he was of the opinion that the mill would treat fully 3000 tons of ore per day.

It is stated that the options which have been held by United States Smelting, Refining and Mining Company interests on

the Godiva, Gemini, Eureka Hill and the Ridge & Valley properties have been extended. The principal interest in these properties is held by the estate of the late John Q. Packard. Engineers have been at work examining the property, and while their reports are in general favorable, it is said that the drawback to the closing of the deal is that the mines did not have sufficient orebodies blocked out to cause the options to be exercised at the present time.

Jesse Knight has entered the Bingham district and his operations in North Bingham are having a stimulating effect in that section. It is probable that a merger of the Knight and surrounding properties will be consummated in the near future. Preparations are being made for the blowing in of the fourth blast furnace at the Tintic Smelting Company's plant in the Tintic district.

An important strike in the Tintic district has been made in the Grand Central mine where an orebody has been opened on the 2000-ft. level. The company is drifting for the same orebody on the 1800 level, and a drift is to be started below the 2000-ft. level. Tintic people believe this new ore to be a part of the famous Centennial-Eureka ore system. Since the strike was made, there has been an increased demand for the stock of the company and the price has reached $2.90 per share.

The Boston-Sunshine Gold Mining Company which began operations last April will declare its initial dividend during the next few days. The amount will probably be 5c. per share, This company was organized last fall to acquire the old Sunshine property in Mercur, which was bought at sheriff's sale. Under the direction of Manager George H. Dern, the mill was reconstructed with a capacity of 150 tons per day and placed in commission in April. In May, $13,400 worth of gold bullion was sent to the Salt Lake Assay Office and the results for June were even better.

Indianapolis

July 12—As a result of several differences existing between operators and miners at the Summit mine, near Linton, the district board ordered the men to quit work and 200 men are out of employment. Both sides are determined to make no concessions and the strike promises to be a long-drawn-out affair. The trouble started six weeks ago when the miners came in contact with some slate in the center of the coal bed. They applied for pay for removing the slate, but the operators refused to grant the request. The operators refused to meet the committee to effect a settlement and finally discharged two men for interfering with the running of the mine. The miners then served notice that unless the operators reinstated the men within five days, with pay for time out, a strike would be called. The operators refused to do this, resulting in the shutdown of the mine.

The report of the Master in Chancery in the Southern Indiana Coal Company and the Indiana Southern Coal Company receivership suits, on the sale of the properties of the two corporations, was filed with the Federal Court July 8. The first named company's property was sold for $1,500,000 and the second named for $1,000,000 and the sale of both properties to the Alliance Coal Company, of Chicago, was ratified by the Court.

Cobalt

July 10—The fire which swept over the northern part of the town, last week, has given the mining companies the much desired opportunity to prospect the ground. The company owning the largest part of the burned area is the Nipissing, and it now has 100 men at work trenching. Whether or not permission will be given to build on this land, depends upon what is discovered. In any case, if rebuilding is allowed the mining companies will have the land properly surveyed into lots, and will try to avoid having the haphazard collection of buildings that existed before.

Work on the Nipissing Central railway, an electric line to run between Cobalt and New Liskeard, is being vigorously pushed. Yesterday an additional hundred men were started to work on the right of way. It is stated that the line will be completed to North Cobalt by October 1, and to Haileybury by the end of the year. It is not expected that work will be started on the portion between Haileybury and New Liskeard before the spring of 1910.

The Taylor Hydraulic Compressed Air Company, which is installing a plant at Ragged Chutes on the Montreal river about nine miles from the town of Cobalt, has one of the intake shafts completed, and there is only about 100 ft. of work still to be done on the other. The outlet shaft has also been completed. In the tunnel, which will be 1000 ft. long, there are 400 ft. of work still to be done. The nine miles of 20-in. main pipe from the plant to the town will also be completed in a short time. This company is putting in the plant, which will have a capacity of 5000 h.p., to supply air to the mines of the district. It also intended to put in a separate plant to supply electric power, but it is understood that an agreement has been reached whereby this will be handled by Beech Brothers, who are putting in an electric power plant at Hound Chutes.

Much interest has been aroused by the new discovery at the Nova Scotia, and it is stated that with the exception of the Lawson and the Temiskaming & Hudson Bay, there is no better surface showing in the camp. The vein has been uncovered for a distance of 90 ft., and it has an average width of about 4 in., and carries very high-grade ore. Two cross veins have also been uncovered, and a shaft has been started at the point of intersection of the main vein with one of these. An interesting feature of the discovery is the fact that the main vein was crossed by a trench dug several years ago, but the vein was overlooked at that time.

The International Nickel Company has had for some months four diamond drills and one churn drill, at work, testing the big nickel deposit at Mileage 222 on the Temiskaming & Northern Ontario Railway. Work was stopped a short time ago and it is believed that the results obtained were satisfactory.

Since the alteration in the mining laws of the province there has been much interest manifested by prospectors and, judging from the number going in, the country will be thoroughly explored. In the month of June there were 50 prospecting parties passed through Ville Marie. The district of South Lorraine is claiming a good deal of attention at the present time and judging from the results so far obtained, it is liable to become an important section. On practically every property within a radius of two miles of Loon lake, work is being done and many discoveries have been made. The principal minerals of the district are those of cobalt, but in nearly every instance silver is also found. The diabase is the favored formation, although finds have been made in the Keewatin, particularly when near a contact with the diabase. Unlike Cobalt, the Huronian conglomerate has proved so far to be practically unproductive. During this summer there will be a great increase in the amount of work being done.

The remainder of the 830 acres of the Gillies Limit mining lands, that were unsold under the recent tenders will be again offered for public sale. The capital of the Silver Cross Mining Company is to be increased from $500,000, to $1,000,000 and the by-law has been passed allowing the directors to sell the issue at 10c. per share. There was a great deal of opposition to the increase and a stormy meeting resulted. Formal application has been filed in the provincial secretary's office at Toronto for permission to increase the capitalization of the Temiskaming & Hudson Bay Company to $3,500,000.

Diamond drilling at the City of Cobalt mine has been stopped and the results obtained have been satisfactory. The drill was operated in the bottom of the shaft and when the hole was in about 300 ft. in the Keewatin formation, the boring passed into diabase, the discovery of which underneath the Keewatin is considered of great importance. Diamond drills have lately been the means of giving a great deal of information regarding the different formations. Only a short time ago the drill working on the Foster located the Huronian slates underlying the Keewatin. As the hole was continued, however, the

slates were found to give way to the Keewatin again.

The annual report of the Buffalo mines for the year ended April 30, 1909, has been issued. During the year a total of 931,991, oz. of silver was produced and the total amount realized from the sale of ore was $478,867. The net profit accruing to the company was $204,289. The board of directors has authorized the enlargement of the present concentrating plant to a capacity of 200 tons per day. The question of power will, it is expected be solved by the hydroelectric companies that are preparing to bring power into the district.

Toronto

July 9—The bounties on iron and steel paid by the Canadian government for the fiscal year ending March 31 last, amounted to $2,467,306, being a decrease of $330,555 as compared with the previous year. On pig iron the bounties paid amounted to $693,423; on steel to $838,100; on wire-rods to $333,090. The production of pig iron was 609,431 tons, a decrease of 74,348 tons, and of steel 570,588 tons, a decrease of 91,351 tons.

The output of coal of the Dominion Coal Company operating in Nova Scotia for the first six months of the year was 1,618,470 tons against 1,922,236 tons for the corresponding period of 1908. As noted last week, the differences between the company and miners belonging to the United Mine Workers of America resulted in a strike on June 6, the company's representatives refusing to meet the executive of the union. The majority of the men employed in the mines came out, those remaining at work being members of the Provincial Workmen's Association, a purely local body. Most of the mines closed down. Contradictory statements as to the numbers of the strikers are given, but the daily output of the mines has fallen off from the normal figure of about 12,000 tons to about one-third of that amount. Some rioting occurred during the earlier days of the strike, and on June 8 a force of 500 troops was despatched from Halifax to maintain order, in spite of the protests of Mayor Douglas, of Glacé Bay, who asserted that the civil authorities were able to deal with the situation. The original question at issue was the recognition of the United Mine Workers, which has been steadily refused by the company, on the ground that as its headquarters are in the United States, it is practically a foreign organization. In this they were upheld by the Conciliation Board appointed by the Government under the Lemieux act. The strikers now demand in addition increased pay and a reduction of hours.

Mexico

July 10—The Greene-Cananea production for the month of June amounted to 3,530,000 lb. of copper, carrying 68,816 oz. of silver and 424 oz. of gold. During the greater part of the month only four of the eight furnaces were in operation, six being the most operated at one time.

The Alvarado Consolidated Mines Company, controlling Pedro Alvarado's famous Palmilla mine in the Parral district is offering 200,000 shares to the public to secure funds for the erection of a 1000-ton mill. James I. Long, of Parral, is one of the directors.

The Greene Gold Development Company, has been formed with a capital stock of 50,000 shares of $5 par value, to acquire the properties of the Greene Consolidated Gold Company. It is stated that sufficient subscriptions have been guaranteed to insure the acquisition of all the old properties. Stockholders in the old company are entitled to subscribe for one share of new stock at par for every ten shares of old stock that they deposit before Aug. 14, 1909, at Room 6, 36 Broad street, New York. The entire assets of the old company were purchased at the bankruptcy sale by J. Thomas Reinhardt, 38 Broad street, New York, who states that all titles have been cleared, debts paid, and the assets turned over to the new company.

Nacozari, Sonora

July 9—Operations at the concentrator and in the mine of the Moctezuma Copper Company have been greatly impeded by the continued drought. The concentrator is working at less than half capacity and the lack of water at the mine is being felt greatly. Should the summer rains be late in coming it will mean a curtailment of operations on the part of many of the properties in this section. The El Aguaje mine of the El Aguaje Mining Company is being pumped out for an examination by W. P. Belding, of Nacozari. A shipment of ore from this property was made several months ago and under capable management much could be expected from the resumption of mining operations.

The railroad situation below Nacozari is progressing about as before with 10 miles of the grade completed excepting three bridges. About 125 men are still at work. On the southern end of the work, tracklaying has been completed as far as El Alamo and grading gangs are now in La Concentracion. From La Concentracion to Tonichi is a distance of about 35 miles over rough country over which, the engineers state, the road will be completed as soon as possible to allow of a spur into the Barranca coalfields. This is said to be the point at which the Cananea, Yaqui River & Pacific is aiming. Bids are now in for a line from Cananea to Agua Prieta, Son., and Douglas, Ariz., and it is expected that work will be started on that line in the near future.

The Washington mine owned by Bostwick & Dickson near Cumpas in the Moctezuma district is reported to have been sold to the Calumet & Arizona interests of Bisbee for a sum approximating $250,000 with a 10 per cent. cash payment. Several hundred feet of development work on this property is said to show an average copper content of 6 per cent., with some ore of a shipping grade. The mine is situated on the divide between the Moctezuma river at Cumpas and the Sonora river at Huepac and is about 20 miles from either place. The development of a large property in this section that would result in the construction of a branch line from the Southern Pacific at Cumpas or in the construction of a new line south from Cananea would open up a practically virgin territory rich in copper and silver prospects.

London

July 2—On the first day of July the new regulations limiting the working hours of coal miners, except in the counties of Northumberland and Durham, came into force. In the excepted counties the rules will not be in force until Jan. 1 next. The act, which is known as the Eight Hours Act, introduces State interference with labor which is condemned by many as unnecessary and of no advantage to the workman. It imposes on mine owners the obligation of keeping additional registers and returns, all of which cost money, and its effect cannot fail to make the working of a mine more difficult. On 60 days in the year the eight hours may be extended to nine hours, reckoned from bank to bank. Such extensions are allowed to take place at the discretion of the manager and need not be on consecutive days. All that is required by law is that the total number of days on which an additional hour is worked does not exceed 60 in any one year. The bill also provides that the King, by an order in council may suspend the operation of the act, "in the event of war or of imminent national danger or great emergency, or in the event of any grave economic disturbance due to the demand for coal exceeding the supply available at the time."

The coming into force of the act threatened at one time to lead to a general strike of coal miners throughout the country owing to differences between operators and men engaged in the South Wales coal mines. The new statutory regulations have called for alterations in the wage scales, and in the arrangement of shifts, changes which cannot be made without causing dissatisfaction to one side or the other. After many conferences in which no agreement could be arrived at, on the night of June 30 a settlement was reached. Thus, a strike of Welsh miners, which would have been supported by all the rest of the coal miners in Great Britain and would have led to a great trade disturbance, has been averted.

Mining News from All Parts of the World

New Enterprises, Installations of New Machinery, Development of Mines and Transfers of Property Reported by Special Correspondents

THE CURRENT HISTORY OF MINING

General Mining News

Phelps, Dodge & Co., Incorporated—The production of the properties embraced in this recently organized corporation, during the first six months of the current year, amounted to 66,400,000 lb. of copper, or at the rate of 132,000,000 lb. per annum. This output was apportioned as follows: Copper Queen, 54,000,000; Detroit, 12,400,000. The Copper Queen figures include the production of the Moctezuma Copper Company, which ships its product to Douglas. The average cost of producing the copper made by the subsidiary properties is stated to be 9c. per lb., including depreciation and ordinary construction. Electrolytic copper for the first six months of this year averaged close to 13¼c., which would indicate a profit of 4¼c., or $2,822,000. This sum is equal to $5.64 per share. On a capital of $50,000,000, the company is paying quarterly dividends of 2½ per cent., which would call for the disbursement of $2,500,000 for the half year. It is evident that the dividend has been considerably more than earned. The company also receives a commission on the sale of copper produced by the Calumet & Arizona and Superior & Pittsburg companies, for both of which companies it acts as selling agents. Furthermore, the Copper Queen smelts a considerable amount of custom ore and all the Phelps-Dodge subsidiary companies maintain mercantile establishments which are profitable undertakings.

United States Smelting, Refining and Mining—A Boston despatch states that for the first time in many months, no "red ink" figures were necessary in making up the earnings of constituent properties of the company for May, when net earnings aggregated $380,000. The profits for May were contributed not only by the Real del Monte company in Mexico and the Mammoth property in California, the Utah mining and smelting operations, but there was also profit in the lead operations at Grasselli, Ind., and at the Chrome smelter and refinery.

Arizona

COCHISE COUNTY

Superior & Pittsburg—From the production of this property, between $40,000 and $50,000 per month are being paid to the Calumet & Arizona treasurer to apply upon the debt to that company.

GRAHAM COUNTY

Arizona Copper—Production for the month of June amounted to 2,496,000 lb. of copper.

Detroit Copper—Referring to the accident at one of the oil-burning boilers, mentioned in the JOURNAL of June 26, 1909, the company writes that this accident was not so serious as first reported. The facts were as follows: "Some oil had accumulated in the firebox of a reserve boiler and when the boiler was started, this oil, not the boiler, did explode and with sufficient force to blow open a cleaning door which struck the forehead of a man standing in front, cutting it rather severely. No other injury was done."

MARICOPA COUNTY

Dixie Queen—This mine has been bonded to B. T. Hickman, of Los Angeles, and C. H. Scheu, of Salt Lake City. A 25-ft. ledge of copper ore is said to have been encountered at the property on the Bill Williams fork of the Colorado river, 17 miles from Bouse.

PINAL COUNTY

Arizona Commercial—The new headframe has been completed and extensive development work is to be carried on, especially on the fifth and sixth levels. The steelwork for the smelter building is in place, and a considerable proportion of the power equipment is on the ground.

Globe Consolidated—Drifting is in progress on the orebody recently discovered, and conditions appear favorable for the development of a good body of ore.

Old Dominion—An orebody 90 ft. long and about 15 ft. wide has recently been developed in virgin ground in the west end of the mine on the 12th level.

California

EL DORADO COUNTY

Grit—Hyatt & Stietz, of Spanish Dry Diggings are putting up a roller mill at this mine, with a crushing capacity of 100 tons daily.

Wizard Mining Company—St. Louis men have bonded the property at Greenwood and are preparing to unwater and develop it. D. L. Shepherd, manager.

HUMBOLDT COUNTY

Klamath River Mining Company—The company, in which Thomas Blair, of Arcata, is a large owner, is preparing to work the Mammoth claims on the Klamath river with dredges.

INYO COUNTY

Newsboy—The mine near Cerro Gordo, one-half mile from the old Union mine, is yielding high-grade silver-copper ore. The property was formerly known as the Crowning Glory and is now owned by the Four Metals Mining Company, Lloyd Skinner, superintendent.

NEVADA COUNTY

Gaston—The tunnel in this Nevada City mine, Claude Ferguson, superintendent, is now in 2600 feet.

Brunswick Consolidated—This Grass Valley company has purchased the Matteson ranch at Union Hill. It is the intention to sink a new shaft on the property. C. H. Mallon is superintendent.

McDonald Ranch—Capt. S. H. Dills and others are sinking a shaft to reach the gravel channel, 250 ft. below the surface.

SIERRA COUNTY

Gold Star—A. A. Charronat and H. L. Englebright, of Nevada City have bonded this mine at Alleghany. There are both gravel and quartz deposits on the 150 acres bonded. The old drifts on the gravel claims will also be cleaned out and further development work done.

Empire—Mendenhall & McIvor will start the old chlorination works and treat the sulphurets now on hand.

Secret Cañon—Work has been resumed on the long tunnel near Forest City. W. H. Weldon, manager.

Goodyear Bar—There is much activity at this old camp and many relocations of abandoned claims are being made.

SISKIYOU COUNTY

Siskiyou Syndicate—In the Borden claim at Snowden, high-grade gold ore has been discovered and in the Balfrey & Addison group in Liberty district, the company has also made a rich strike.

Atterberry—The new mill on the property in Quartz valley is ready for operation. J. M. Morrison is one of the owners.

YUBA COUNTY

Red Cross and Golden Star—C. S. Warren, of Butte, Mont., W. W. Warren, of Gold Circle, Nev., and others have purchased the Laymarce placer between Indian ranch and Dobbins. The mines included in the purchase are the Red Cross, Golden Star, Good Templar and 80 acres owned by the Yuba Gold Mines Company. New machinery and pumps are to be put on the Red Cross at once.

Colorado

BOULDER COUNTY

Livingston Leasing Company—The mill on North Boulder creek is to be remodeled into a cyanide plant to treat the ores from company mines at Sugar Loaf. Screens and other mill supplies will be required. W. R. Doty, manager, 1635 Champa street, Denver.

Wood Mountain—Manager J. B. Annear, of Boulder, reports opening up a high-grade streak of smelting ore and a 12-ft. vein of lower grade, in the winze workings at a depth of 800 ft. Some improvements will be made in the company's mill.

Copper Consolidated—Developments in the Fourth of July mine, near Arapahoe peak are said to warrant the erection of a 50-ton mill at the portal of the tunnel. The company also contemplates installing an aërial tramway over a mile in length to transport the ores over the divide. Mr. Johnson, of Eldora, Colo., is president of the company.

Alton Mining and Milling—Extensive tests are being made on the ores of the company at Cardinal, Colo., and it is reported that the company will erect a mill. Large orebodies are said to have been opened in the tunnel workings.

Smuggler—Dopp & Warren, lessees on this mine at Ballarat have recently been shipping exceptionally high-grade ores.

Utica Hill—It is reported that this company operating at Ward will soon commence work on their proposed cyanide mill.

Myrtle Mining Company—The cyanide plant at Ward, Colo., which was destroyed last year, is to be rebuilt.

Milwaukee—This property at Sunnyside is to be equipped with new machinery and resume operations after a shutdown of several years.

Reppy—Manager J. Bailey, of Sugar Loaf, who is making a business visit in the East reports that operations are to be resumed at once, and that additional machinery will be required.

GILPIN COUNTY

Mountain Monarch—Centerville, Ia., people have become interested and operations have been resumed under the management of M. S. Shanks, Rollinsville, Colo. An air-compressor plant may be installed.

Pendleton-Gomer Mines Company—This company has acquired the Gomer and other property, comprising 17 acres in the Russell district. A. A. Johnson, Equitable building, Denver, is general manager. A heavier hoisting plant and a compressor are to be installed. Work is to be carried on through the shaft as well as from the Newhouse tunnel lateral, which gives a vertical depth of 1700 feet.

Nebula—The Maumee Valley company has sold to George D. Begole during the last week, a group of eight lode claims and a tunnel site in the Russell district, near to the famous War Dance. Liberal development is to be carried on at the property.

Bullion—Jacob Schmidt, of Central City, has taken a lease on this group in Eureka district and will install machinery.

Incidental Mining Company—This company has secured a lease and bond on the Hall claim, adjoining the Incidental. W. L. Shull, Russell Gulch, Colo., is manager.

LAS ANIMAS COUNTY

Cedar Coal and Coke Company—An explosion occurred on July 6 in the mine at Tollerville, near Trinidad. Nine men, descending on a cage, were killed.

Colorado Fuel and Iron—The new coal washery at Sopris has been placed in operation after waiting three weeks for power, the plant of the Southern Colorado Power Company, which supplies part of the power, having been damaged by fire.

LAKE COUNTY—LEADVILLE

Highland Mary—At a depth of about 50 ft. a body of gold-bearing ore has been opened. The property is situated between the Little Jonny and the President, and in early days shipped considerable ore from the old shaft, south of the recent strike.

Vinnie—Instead of operating through the Yak tunnel, in the future the work will be carried on through the main shaft, and all ore hoisted to the surface. The mine has recently been well equipped with electrical machinery.

Star of the West—A good grade of iron and lead ore is being shipped from this claim. Development work is being pushed with the hopes of catching the south orebody opened last fall.

London—The winter's supply of ore stacked as it came from this mine in the Mosquito district, is now being sent to the smelters at Denver. A number of orewagons are busy hauling to Alma from the mine.

Twin Lakes Placer Mining Company—A full force of men are at work for the season and the company is using three little giants and washing a large amount of ground. N. N. Loggin is manager, with headquarters at Granite.

OURAY COUNTY

Revenue—Leasers on the Glacier vein of the Revenue tunnel have shipped 100 tons of smelting ore. Another 100-ton shipment is also to be sent out by leasers on the old Virginius mine.

Mono-Baltic—The erection of a smelter for this property at Ironton is contemplated. M. T. Chestnut, manager.

TELLER COUNTY—CRIPPLE CREEK

Robert Burns—George Hawkins et al., of Cripple Creek, have taken a two-year lease on this property on Guyot hill. A new shaft will be sunk near the center of the claim.

Jay Bird and Maid—These two claims on Bull hill, adjoining the War Eagle, have been leased to R. G. Harrison and associates, of Colorado Springs. The lease is for two years on graded royalties of from 15 to 30 per cent.

Idaho

SHOSHONE COUNTY

Tamarack & Chespeak—A body of shipping ore recently encountered in the Leonard tunnel is holding up well under development.

Carney Copper Company—A 6-ft. vein of copper sulphide ore has been encountered in a drift about 60 ft. from the intermediate tunnel. John Foss, of Mullan, is in charge of the work.

Granite & Allie—Two shafts have been sunk on the property, near Murray, to a depth of 100 ft., in drifting from which a body of ore of good milling grade has been opened. The 10-stamp mill of the company is being converted into a 40-ton silver-lead concentrator.

Hypotheek—Ore has been encountered at this property near Kingston. Octave Guay is manager.

Moonlight—A 3000-ft. adit is to be driven from Cañon creek to develop this property. The flow of water in the intermediate workings has caused a cessation of work in the orebody there.

Caledonia—Eight cars of ore were taken out during June in the development of this property, no ore being stoped. About 35 men are working under the directions of Charles McKinnis, of Wallace.

Indiana

CLAY COUNTY

Operators in the block-coal district are now preparing for the annual mid-summer rush of orders, which usually commences near the middle of July. A number of mining companies are making repairs at their shafts so as to be in readiness for the rush when it comes. The work in this district has been good in comparison to that of some districts in western Indiana. Most of the mines are getting in only a day more than half time and a rush will be welcomed by all concerned. A peculiar thing is that while many of the block-coal mines have been working from half to two-thirds time the Miami Coal Company's mines have been running full blast all summer. This company is fortunate in being connected with other large concerns and consumers in Chicago which insures a steady sale of coal. The United States Steel Corporation takes 1500 tons per day.

SULLIVAN COUNTY

W. B. McClellan, general superintendent of the Consolidated Indiana Coal Company, and receiver for the Deering

company, appeared before the county board of review and asked for a reduction in valuation on mine property in the county, which has been idle for two years.

Louisiana

Oil production during June was 286,200 bbl., being 20,070 bbl. more than in May. Shipments by rail were 147,095 bbl.; by pipe-line, 18,884; total, 165,979 bbl. There were 15 new wells completed in June, 9 being oil producers, 2 gas producers and 4 dry holes. There were only two wells under the drill at the end of the month.

Massachusetts

FRANKLIN COUNTY

Massachusetts Talc—About 12 men are employed at the mine and 6 at the mill. The talc is hauled from the mine at Rowe to the mill at Zoar by wagon. The mill is turning out 20 tons of finished product daily.

Davis Sulphur—The ground between shafts Nos. 1 and 2, about 300 ft. long, caved from the surface to the first level. The picking floors, bins and loading chutes are badly damaged. Shaft No. 1, now 1400 ft. deep, is endangered. The mine is shipping 75 tons of ore daily. Sixty men are employed. H. R. Craig, superintendent, Davis, Mass.

Michigan

COPPER

Wyandot—The company has resumed crosscutting from the 700-ft. level of its exploratory shaft. This work has been temporarily suspended while preparations were being made to start drifting on the amygdaloid lode that was exposed in the crosscut. It is the intention to complete the crosscut from the 700-ft. level to the eastern boundry of the tract and also the one at the 350-ft. level which is being driven westward. When these crosscuts have been completed, attention will be given to the various lodes exposed with the hope of developing paying ground.

Superior—Operations are to be resumed at the No. 2 shaft, which has been at a depth of about 200 ft. for some time. The machinery from No. 1 shaft which was replaced by that of larger capacity, has been moved over to this, shaft and will soon be ready to go into service. The drifts south from No. 1 shaft toward No. 2 is in good grade of rock and with this shaft in operation a much larger tonnage will be handled

Keweenaw—The company continues diamond drilling throughout its tract with the view of disclosing the various lodes traversing these lands. Sinking has been discontinued at its Medora shaft, but the west fissure vein is to be exposed at the 17th level and its condition fully determined at that depth.

Trimountain—The improved condition that was noticed some months ago in this company's four shafts is being maintained. All four shafts are being sunk and the ground opened at depth is yielding better than previously. Rock shipment of from 900 to 1000 tons daily are being sent to the mill.

Mohawk—The new shaft on the southern portion of the tract and to be known as No. 6, is down about 40 ft. in the overburden and it will require nearly another month before the shaft is well established in the ledge. Drifts from shaft No. 5 are revealing a better grade of rock than elsewhere in the mine. Rock shipment of about 2700 tons, averaging about 15 lbs. of copper, are being sent to the mill, daily.

New Baltic—The company has reached the ledge with its sand pipe through which the second drill core will be taken to reveal the formation at depth; the drill will go down at an angle of about 47 deg., and perpendicular to the lode. The first hole was put down vertical, but encountered a shattered zone and the results were unsatisfactory.

Ojibway—Both shafts are bottomed at the 950-ft. level, where stations are being cut, ready to begin crosscutting to the formation, and as soon as this work is under way, sinking will again be resumed.

Hancock—At a meeting of this company held recently, John L. Harris, formerly superintendent, was made general manager. The company also exercised its option on a piece of land bordering on Portage lake for a mill site, but nothing will be done in regard to the erection of the mill for some time. Conditions at the mine continue favorable. The winze that is being sunk from the 13th level of No. 1 shaft on No. 3 lode is down below the 15th level and is in the same good ground that has been in evidence throughout. At the 11th level a sump is being put in to take care of the water down to this point. Sinking is in progress at No. 2 shaft, below the 18th level.

Missouri

JOPLIN—ZINC-LEAD DISTRICT

Cleveland Faucet Company—H. R. Williams, of St. Louis, has purchased 40 acres at the mouth of Gordon hollow, southwest of Joplin, and has developed 16 ft. of sheet ore at a depth of 156 feet.

Fuel Gas—The Natural Gas Company has served notice on all mills using natural gas for fuel that gas will not be furnished them after Dec. 15, 1909.

Montana

BUTTE DISTRICT

British Butte—Col. M. H. De Hora, general manager, according to London advices, is negotiating with San Francisco manufacturers for the construction of five more dredges to be installed at the property near Rocker. No figures of the clean-up have been made public, but it is announced by Colonel De Hora that the returns have been satisfactory. A diamond drill is to be placed upon the property shortly for the purpose of exploring the depth of the ground that is being worked.

GRANITE COUNTY

Bi-Metallic—Three shifts are at work on the new cyanide plant at the mill and several of the large concrete tanks are almost completed. A new motor is also being installed.

JEFFERSON COUNTY

Montana-Corbin Copper Company—The company has recently acquired the property of the Corbin-Wickes company, consisting of the Hidden Treasure and Copper King lode claims, at Corbin, near the Boston & Corbin property. Options are also held on the Park No. 1, Park No. 2, Black Eagle, Black Eagle No. 2, Dorsey and K. & R. quartz claims. The following are the directors of the new company: Charles A. Clark, George F. Bartlett, William B. Arnold, Arthur P. Hawes and Norman J. MacGaffin, of Boston, Charles W. Andrews, of Chicago, and Edwin L. Mayo, of Butte.

LEWIS AND CLARK COUNTY

Missouri River Power—Ex-governor S. T. Hauser has recently returned from New York and states that work will shortly be begun reconstructing the Hauser lake dam. The dam was destroyed by the extraordinary floods of 1908.

Nevada

ESMERALDA COUNTY—RAWHIDE

Kearns No. 2—This lease has been let to San Francisco capitalists who are to sink the shaft to the 1000-ft. level. The new company took charge on July 1.

Codd Mines Company—The company has secured an extension of five years on the St. Ives lease, on the Rawhide Queen, and now has funds to sink to the 1000-ft. level. Air compressor, drills and a new hoist will be required.

Grutt-Balloon Hill Lease—High-grade ore carrying gold and silver in about equal proportions was recently struck on the 185-ft. level.

North Rawhide—A new strike of gold ore has been made five miles north of Rawhide; rich ore has been found in pockets.

LINCOLN COUNTY—PIOCHE

Ely Valley—The shaft at this mine is to be sunk from the 300-ft. level to a depth of 500 ft. Manager Edward Thomarson is leaving to consult with English shareholders regarding further equipment. He will return in September.

LYON COUNTY

Nevada-Douglas—While enlarging the

main incline from the 400- to the 500-ft. level, the copper orebody developed was sampled every five feet and is stated to average about 7 per cent. copper for the 100 ft. The lower-grade orebodies of the mine were recently sampled by Consulting Engineer Duncan McVichie to ascertain whether it would be more economical to mill these than to smelt them direct. S. S. Arentz, Yerington, is superintendent.

WHITE PINE COUNTY—ELY

Ely-Central—Work will shortly be commenced on the three-compartment shaft to be sunk on the Eureka Fraction claim. The drill on the Clipper claim, about 2000 ft. northwest of the Nevada Consolidated's steam-shovel pit, is down about 400 ft., and is still in the oxidized formation.

Nevada Consolidated—The fifth steam shovel for the open-pit operations of this company has been received and will in a measure counterbalance for the Steptoe works, the curtailment of production at the Cumberland-Ely as the result of the strike.

Cumberland-Ely—On July 1, 400 miners at the Veteran mine struck, tying up this company's operations temporarily. The men objected to the contract system in vogue and asked a straight $3.50 per day for miners.

Giroux Consolidated—Preparations are being made for the sinking of a new five-compartment shaft to be put down about 700 ft. southeast of the old Alpha shaft. It is expected that the work will be prosecuted by raises from both the 1000- and 700-ft. levels, in an effort to have the shaft completed within six months. Two Prescott pumps are being installed in the Alpha shaft. Operations with Keystone drills are continuing in the vicinity of the Giroux shaft, where it is claimed that an orebody has been developed containing, approximately, 7,000,000 tons of ore averaging 2.25 per cent. copper.

New Mexico

LUNA COUNTY

National Mining and Smelting Company—A Tucson, Ariz., despatch quotes President Robert E. Powell as authority for the statement that the smelter at Deming would resume operations about Sept. 1, with increased capacity, including both copper and lead furnaces. The plant has heretofore confined its operations to lead smelting.

Pennsylvania

BITUMINOUS COAL

Pittsburg Coal Company—The local board of the United Mine Workers has ordered a strike of all the miners employed by the Pittsburg Coal Company, on July 15, all efforts to settle matters by agreement having failed. The grievances that have brought about the rupture include objections by the miners to the new safety explosives the company is now using, which the men claim break the coal too much and reduce their earnings, as well as allegations that the company had broken the agreement on the eight-hour law, on the dead-work scale, and on the check-off system. At latest reports, President Lewis, of the United Mine Workers, was trying to bring about a settlement with good prospects of success.

Vesta—Fire started in this mine, near California, on July 10. At latest accounts all the local appliances had failed to check the fire, and all the men available had been set at work to lay a 4-in. pipe from the Monongahela river, three miles away. The water from the river will be used to flood the mine.

South Dakota

LAWRENCE COUNTY

Minnesota Mines—This company at Maitland has completed a 1500-ft. tramway from its open cuts to the mill; a new Chilean mill has been installed bringing up the capacity from 100 tons to nearly 200 tons daily. The open cuts are to supply the increased tonnage.

Columbus Consolidated—A meeting was held on July 13 in Denver to consider a long-time lease of the property. The proposition is presumed to come from Frank Gardner and Cincinnati capitalists who recently visited the property.

Southern District—The Altia Mining Company is sinking below the quartzite horizon to open up bodies of ore which may exist in the underlying schists. The Anaconda company, on Elk creek, is deepening its shaft. The Golden Girl shaft is now down over 80 ft. The Custer Peak company is making its shaft a double compartment and sinking below the 200-ft. level. Operations are to be resumed on the Lucky Strike property.

Homestake—The company has completed and is now operating the creosoting plant in Lead. The plant was formerly at Englewood and was built as a government testing plant. The present capacity is 3000 ft. per day. The treated timber will be used underground, and is expected to last from 10 to 15 years longer than untreated timbers.

Tennessee

POLK COUNTY

Ducktown Sulphur, Copper and Iron—At the recent annual meeting of this company in London, Managing Director Gordon stated that the "ore in sight" in the Mary mine was 311,000 tons, much of which would average 2.3 per cent. copper, and that they may reasonably expect that 600,000 tons may be extracted from this mine. The Isabella mine is being prepared for a small output for experimental purposes. The East Tennessee mine is now about ready for production, the railroad having been completed and placed in operation. The ores developed in this mine are reported as averaging 3.5 per cent. copper. Present ore resources provide for continuous operations until well into 1913, assuming no new discoveries which have been constantly taking place during the 19 years of the company's operations. The smelting plant was closed during a part of May to connect the dust chambers and flues with the new sulphuric acid plant, at which time some alterations were made in the furnace construction.

Utah

BEAVER COUNTY

Erie—A strike of high-grade lead ore carrying some silver and gold has been made in this property which adjoins on the northwest the main group of the Utah Gold and Copper Company. A 3-ft. orebody has been opened at a depth of only eight feet.. J. S. Grow, general manager, Beaver, Utah.

Utah-Gold & Copper—The first vein cut by the main tunnel has widened from 6 to 12 ft. as disclosed by drifting southward on the vein. The north drift is encountering improved conditions. The hydroelectric plant is almost completed. J. T. Breckon, manager, Beaver, Utah.

JUAB COUNTY

Tintic Standard—In the last 22 days, the shaft has been sunk 100 ft. and the raise has covered the same distance. E. J. Raddatz, manager, is in Salt Lake to arrange for electrical equipment for the shaft.

Chief Consolidated—A large number of eastern stockholders visited the properties last week. The mines are being actively opened and the shareholders were pleased with the results already gained.

SALT LAKE COUNTY

Bingham Mines Company—A contract has been entered into with the Yampa Smelting Company for treating the output of the Commercial mine; the shaft is to be pumped out and production commenced at the rate of 150 tons per day. An electric-haulage system is being installed in the tunnel. The Dalton and Lark mines of the company are also producing.

Utah Leasing Company—This company has been organized in Salt Lake to take over a lease from the United States Mining Company to J. C. Dick of a portion of the Old Telegraph mine in the West Mountain mining district at Bingham. J. C. Dick is president and general manager; F. C. Dern, vice-president and treasurer; A. Thomas, secretary, and these with Samuel S. Porter and E. E. Price are the directors.

Flagstaff—Work is progressing on this old property at Alta and it is figured from the latest survey that connection from the tunnel can be made with the 900-ft. level of the former workings within the next 30

days. An assessment was made to complete this work. A. J. Beveridge, manager, Alta, Utah.

SUMMIT COUNTY

New York Bonanza—Pumping is to be resumed and the shaft sunk from the present depth, 825 ft., to the 1000 level. M. G. McGill, manager, Park City.

UTAH COUNTY

Miller—D. R. C. Brown of Aspen, Colo., and David Taylor of Salt Lake, lessees of this American Fork mine, have secured an option to purchase the property.

Mountain Dell—J. H. Wooten, a large shareholder, reports that there is ore on the dump ready to ship as soon as the road is repaired from the damage done by the recent washouts. He states that the tunnel to the old workings has been completed and that much ore has been blocked out.

WASATCH COUNTY

American Steel and Fuel Company—This company has been organized for the purpose of developing iron deposits covered in claims known as Sunset Iron, Nos. 1 to 16 inclusive, and Red Devil Iron, Nos. 1 to 8 inclusive. B. F. Bauer, of the Salt Lake Hardware Company, is president.

Vermont

ORANGE COUNTY

Vermont Copper—The repairs which were necessitated by the burning of the smelter building last February are nearly completed. The furnace will be ready for operation about Aug. 1. The smelter and mine are equipped with electric power throughout, supplied by a hydroelectric plant, 10½ miles from the mine. Under normal conditions the plant will generate 800 h.p. Two diamond drills are now in use to prospect new ground. Charles Of, South Strafford, is general manager.

Washington

SNOHOMISH COUNTY

Index—This region is experiencing a revival of a former mining fever. Eastern capital is seeking investment through several emissaries. George H. Cook, a Minneapolis lumber dealer, is investigating a number of properties.

Wisconsin

DANE COUNTY

Wisconsin Iron Mining—Drilling operations carried on by this company two miles north of Deerfield on the John McCormick farm are stated to have passed through 35 ft. of ore.

ZINC-LEAD DISTRICT

Platteville—Three additional zinc producers will shortly be added at this camp; the Wisconsin Zinc Company has removed the Royal mill to the Mitchell Hollow; the Trego is pumped out and will be operated by the Big Four Mining company, under the management of P. R. Grey, of Cuba City; the Weigle has been re-opened by the Standard Zinc Company. It is reported that the Big Jack will be reopened by the Wisconsin-Missouri company.

Bessie—A milling plant will be purchased at once for the Bessie and Maid of Erin properties, at Shullsburg; northern Michigan capitalists, represented by C. E. Lawrence, of Iron Mountain, Mich., hold fee to 400 acres on which these properties are located. The territory adjacent to Shullsburg produced much lead in the early days but has been slow in developing zinc properties. New activity is now in evidence, however; the Brown-Croft has resumed and the Lake Superior is preparing to re-open.

Beloit-Elmo—The company has produced its first car of concentrate, which assays 60 per cent. zinc; the ore occurs in a fractured formation and carries considerable lead, but is almost entirely free from iron.

Fields—R. S. Landers, of Galena, Ill., is negotiating for a 100-ton mill for this property at New Diggings, 4 miles southeast of Benton.

Mexico

CHIHUAHUA

American Smelting and Refining—Owing to damage to the blowing equipment, this company's plant at Chihuahua was obliged to close down its furnaces for a short period during June, but the plant is again operating. It is again reported that the work of adding two additional lead furnaces will begin shortly.

Guadalupe y Calvo—In this section lying in the extreme southwestern part of the State there is increased activity, the leading operators being Harlan Brothers, of St. Louis, and M. W. Lafayette. The nearest railroad point is now Ojite on the Parral & Durango railway. Mr. Lafayette is preparing to install a small cyanide plant.

Parral—The approximate production of this camp for the week ended July 2 was 5060 tons of milling ore and 3540 tons of smelting ore, as compared with a total tonnage of 9390 for the preceding week.

Manta Mining Company—This is a newly organized English company that has begun operations at Santa Eulalia. A 1000-ft. shaft has been started under the direction of Manager Frank Holmes. The acquired property is that known as the Carmen-Negrita located in the Mina Vieja part of the camp. Walter Maclachlan, identified with the San Francisco del Oro mines in the Parral district, is a leading spirit in the enterprise.

SONORA

Pedrazzini Mines—Manager E. L. Dufourcq, of New York, recently visited the property in the Arizpe district and states that the 4-mile aërial tram is finished and the wagon road about ready for the transport of ore to Nacozari, thus saving the 90-mile pack to Querobabi on the Sonora railroad. The mill has been shut down through lack of water for some months but the second-class ore has been piled on the dump and mining operations continued as usual.

Transvaal Copper—Work is continuing on the Cobre Rico, Buckeye and Transvaal mines with a force of about 100 men. Some milling ore is being encountered but the smelter is idle and no shipments are going out. H. C. Beauchamp, manager.

Minneapolis Copper—Development work is being done with a small force, after a shutdown of several months. Thomas L. West, of Cumpas, is in charge.

Canada

ALBERTA

The McGillivary Coal and Coke Company, at Coleman, and the West Canadian Collieries, Ltd., at Bellevue, have each contracted with the C. O. Bartlett & Snow Company, Cleveland, O., for a new steel tipple; both contracts being placed through F. C. Greene, mining engineer for the companies. Each contract includes a steel tipple with all the necessary machinery, including Greene patent transfer dump, type No. 4, for each plant, as well as a complete power plant equipment and haulage system. The plants will be electrically operated entirely and are to be in operation by Nov. 1 of this year.

West Canadian Collieries, Ltd.—A new coal-handling plant is being installed at the Bellevue colliery, near Frank, and 15 more cottages for company employees are being erected. C. L. Rameau, Blairmore, is general manager.

BRITISH COLUMBIA—BOUNDARY

Jewel—Another hoisting engine and a six-drill air compressor are being added to the power plant. The installation of the stamp mill is nearly completed. R. Roberts is manager, and the mine and mill are situated in Long Lake camp, Greenwood mining division.

New Dominion—It is announced that the New Dominion Copper Company has appointed P. F. Roosa, manager, and Charles Rundberg, superintendent of mines, and that copper mining and smelting will be resumed in August.

ONTARIO—COBALT

Temiskaming—Seven inches of high-grade ore has been encountered in a drift from a winze sunk 50 ft. below the 250-ft. level. A crosscut is also being driven from the bottom of the winze to tap the No. 1 vein. The winze is the deepest working of the mine.

Badger—Work has been started rebuilding the plant destroyed by fire last week.

Metal, Mineral, Coal and Stock Markets

Current Prices, Market Conditions and Commercial Statistics of the Metals, Minerals and Mining Stocks

QUOTATIONS FROM IMPORTANT CENTERS

Coal Trade Review

New York, July 14—Coal trade in the West is improving steadily, though gradually. Good reports continue to come from most of the central States. The demand for steam coal is increasing. The chief drawback is the tendency—always present when trade is improving—to overproduction, which tends to clog the markets at the chief distributing centers, and so keeps down selling prices.

The Eastern bituminous trade is improving, although rather more slowly than in the West. A competition is making itself severely felt in the Seaboard trade and, as noted below, the Clearfield operators have asked for a reduction in the mining rate to enable them to meet the sharp competition of the West Virginia operators, who are offering coal at very low prices throughout eastern consuming territory.

Anthracite trade is quiet and steady on the usual summer basis. The June production showed a smaller decrease from May than was generally expected. The prolonged drought is making trouble at some of the anthracite collieries, where water supply is beginning to run short.

Wage Troubles—A conference was held in Philadelphia, July 7, between a committee of operators from the Clearfield and other central Pennsylvania mining districts, and representatives of the United Mine Workers from those districts. The operators ask the miners to consent to a reduction of 16c. per ton on the mining scale, claiming that otherwise it will be impossible for them to compete with West Virginia coal at the prices at which it is now offered. The present scale, which took effect April 1 last, is 66c. per ton. It is understood that the miners' representatives were willing to accept a reduction, not naming the amount. The question, however, will have to be referred to a district convention of the miners.

The Anthracite Combination Suits—In the suits brought under the Sherman law against the anthracite carrying roads, the taking of testimony for the companies has been closed. The taking of testimony in rebuttal for the Government has been postponed until September, the date to be fixed by the examiner.

Coal Traffic Notes

Tonnage originating on Pennsylvania railroad lines east of Pittsburg and Erie, year to July 3, short tons:

	1908.	1909.	Changes.
Anthracite	2,753,037	2,585,965	D. 167,072
Bituminous	16,267,127	17,752,713	I. 1,485,586
Coke	3,418,434	5,058,694	I. 1,640,260
Total	22,438,598	25,397,372	I. 2,958,774

The total increase this year to date was 13.2 per cent.

Coal and coke tonnage of Chesapeake & Ohio railway, 11 months from July 1 to May 31, short tons:

	Coal.	Coke.	Total.
New River	6,085,061	252,248	6,337,309
Kanawha	4,667,253	27,633	4,694,886
Kentucky	310,295	.....	310,295
Connecting lines	206,303	74,429	280,732
Total	11,268,912	354,310	11,623,222
Total, 1907-08	9,699,620	316,465	10,016,085

Deliveries this year to points west of mines, 5,751,305 tons coal and 200,572 coke; points east, 1,405,302 tons coal and 153,738 coke; tidewater, 4,103,443 tons coal; anthracite to line points, 8862 tons. Total increase in tonnage this year was 1,607,137 tons, or 16 per cent.

Anthracite shipments in June were 4,904,858 long tons, being 159,015 tons less than in May, and 799,994 tons less than in June, 1908. For the six months ended June 30 the shipments were, in long tons:

	1908.	1909.	Changes.
Reading	6,080,172	6,174,873	I. 94,701
Lehigh Valley	5,657,264	5,273,683	D. 383,581
N. J. Central	4,327,781	4,016,017	D. 311,764
Lackawanna	5,051,814	4,721,969	D. 329,845
Del. & Hudson	3,275,120	3,399,367	I. 124,247
Pennsylvania	3,105,226	2,980,672	D. 124,554
Erie	3,723,436	4,016,129	I. 292,693
N. Y., Ont. & West.	1,447,629	1,369,920	D. 122,291
Total	32,668,442	31,952,630	D. 715,712

The total decrease was 2.2 per cent. Three companies—the Philadelphia & Reading, the Delaware & Hudson and the Erie—showed increases; the others had decreases from last year.

Coal tonnage originating on the Southern railway, four months ended April 30, was: Tennessee district, 436,983; Alabama district, 755,264; total, 1,190,247 short tons, an increase of 381,443 tons over last year.

Coal receipts at Boston, six months ended June 30, reported by Chamber of Commerce:

	1908.	1909.	Changes.
Anthracite	882,058	875,989	D. 6,069
Bituminous	1,522,880	1,627,686	I. 104,806
Total domestic	2,404,938	2,503,675	I. 98,737
Foreign	223,950	143,102	D. 80,848
Total	2,628,888	2,646,777	I. 17,889

The foreign coal reported comes chiefly from Nova Scotia.

Shipments of Broad Top coal over the Huntingdon & Broad Toy railroad for the six months to July 1, were 303,647 tons in 1908, and 211,485 in 1909; a decrease of 92,162 tons.

Cola passing through Sault Ste. Marie canals, season to July 1, short tons:

	1908.	1909.	Changes.
Anthracite	364,914	448,397	I. 83,483
Bituminous	1,396,961	1,893,135	I. 496,174
Total	1,761,875	2,341,532	I. 579,657

The total increase for the season this year was 32.9 per cent.

New York

Anthracite

July 14—The Anthracite market is dull and quiet; about the usual business is being done with no particular incident or change. All sizes are in good supply.

For prepared sizes prices are unchanged, at the regular schedule of $4.55 for lump and $4.80 for egg, stove and chestnut, f.o.b. New York Harbor. For steam sizes quotations are; Pea, $3.15@3.25; buckwheat, $2.25@2.50; No. 2 buckwheat or rice, $1.75 @2; barley, $1.35@1.50, all f.o.b. New York Harbor. Some washery pea and buckwheat are offered at 10 or 15 cents less.

Bituminous

The bituminous trade improves slowly, but operators are living in hope, and there has been some actual improvement. There is more buying in New England territory, the far east doing much better than the Sound ports. New York Harbor is pretty quiet, and buyers seem to be spending their time shopping around for cheap coal. Prices are not much changed, ordinary grades of steam coal selling at $2.40@2.50 f.o.b. harbor points, while better grades command up to $2.60@2.70. Gas coal is in fair demand with slack still inclined to be scarce and bringing a better comparative price than run-of-mine.

The Coastwise trade is improving a little but vessels are still in good supply. Larger boats predominate, smaller ones not being so plentiful. Rates continue unchanged at 60@65c. from New York to points around Cape Cod and 35@45c. to Providence, New Bedford and Long Island Sound.

Birmingham

July 12—Coal operations in Alabama are taking on some life again. The output, however, has not yet reached a stage to attract particular notice, but it is much better than it was a couple of months back. It is given out on good authority

that some good contracts for fall and winter delivery have already been placed in this district and that there should be a steady output in the near future.

Chicago

July 12—Quiet conditions continue in the coal market, with the harvesting trade increasing and the steam trade using more and more fine coals, to the weakness of the demand for lump from western mines generally. Screenings from Illinois and Indiana mines are the most active commodity in the market, except smokeless, over which retailers are waging a sharp war with the result of low retail prices. The situation as regards smokeless, however, is not relapsing into the conditions of a few weeks ago, when shipments were much too large and demoralization of the wholesale trade resulted. Domestic coals are naturally at a low stage; wholesalers are trying to better the demand for lump by offers of low prices, but with few purchasers. Demurrage coal is plentiful at times, including western lump, smokeless and Hocking.

Illinois and Indiana coal brings $1.75@2.15 for lump and egg, $1.60@1.75 for run-of-mine and $1.50@1.75 for screenings. Smokeless lump brings $3.05 and smokeless run-of-mine, $2.95 for Pocahontas and New River, with lower-grade smokeless 10 or 15c. less, the freight on smokeless being $2.05. Hocking lump is still in large supply though finding a steady sale at $2.90. Brazil block is strong at $2.80. Anthracite still lags, with the result that considerable independent coal is being sold at low prices. Youghiogheny is in light demand at $3.15 for ¾-in. gas, moving chiefly on contracts. Pittsburg No. 8 sells at $2.65 and has a quiet market.

Cleveland

Lake trade is going on steadily, and the coal accumulated on the railroad tracks is being diminished.

Local trade is better. There is a sharp demand for slack, which is in short supply, while lump is too plentiful. The quotations for No. 8 district coal are $1.90@2.05 for lump, $1.70@1.80 for run-of-mine, and $1.40 for slack. Middle-district coal can be had at $1.85@2 for lump, $1.65@1.75 for run-of-mine, and $1.30 for slack. In some cases 5c. more has been paid for slack.

Indianapolis

July 13—There has been no perceptible change in the mining industry of the State during the past week. The output was about the same as the previous week, although the railroad companies say there has been a decided decrease in empty coal cars. Operators say domestic orders continue to come in but there is no great rush on the part of retail dealers.

Pittsburg

July 13—It is understood that the labor difficulty which threatened a strike against the Pittsburg Coal Company has been settled. Operations by the railroad mines are slightly increased, due to a somewhat heavier movement to the Lakes. The stage in the rivers is the lowest of the season, and river mines are not working as well, as there is no prospect of a shipping stage for some time. Nominal prices remain at $1.10 to manufacturers and $1.20 to retail dealers for mine-run, these prices being shaded 5 or 10c. as formerly. Slack remains at 60@65c. per ton.

Connellsville Coke—The coke market is dull, there being little demand for prompt, while contracts for the half-year have all been made. Nothing interesting has been heard the past week of the proposed coke merger, and it is not altogether improbable the movement will die of inanition.

Prices on standard Connellsville coke remain: Furnace coke, prompt, $1.55@1.60; contract, $1.65@1.75; foundry, prompt, $1.80@2; contract, $1.90@2.25.

The *Courier* reports the production in the Connellsville region in the week ended July 3 at 324,181 tons, a gain of 4000 tons. Shipments are reported at 4709 cars to Pittsburg, 7250 cars to points west of Pittsburg and 825 cars to points east of Connellsville; a total of 12,784 cars.

Foreign Coal Trade

Belgian Coal Trade—Imports of coal into Belgium, five months ended May 31, were 2,310,000 metric tons, an increase of 162,000 tons over last year. Exports were 1,987,000 tons, an increase of 149,000 tons from 1908. The excess of imports over exports this year was 329,000 tons, or 13,000 tons more than last year.

Welsh Coal Prices—Messrs. Hull, Blyth & Co., London and Cardiff, report current prices of coal as follows, on June 19: Best Welsh steam, $4.32; seconds, $4.08; thirds, $3.96; dry coals, $4.14; best Monmouthshire, $3.60; seconds, $3.48; best small steam, $2.70; second, $2.58. All per long ton, f.o.b. shipping port.

Iron Trade Review

New York, July 14—Notwithstanding that summer is now well upon us, when a quiet market is looked for, the iron and steel trades continue to show a condition of activity which is encouraging. The strongest point is that buyers seem to have passed the tentative stage and are inclined to make contracts running well over the second half of the year.

In pig iron the size of new transactions has shown a marked increase. Some heavy contracts have been made by large consumers, such as the International Harvester Company and the American Radiator Company; and the volume of smaller orders has reached a pretty large total. In foundry iron these orders have come from over a considerable territory; and it is especially to be noted that many New England machinery manufacturers who have heretofore been holding back, are now coming into the market. The reasons for this are twofold, one being an increase in orders received and the other a conviction that prices cannot be expected to go any lower under present conditions. Basic iron has also been in good demand, and several large contracts have been placed. The furnaces are correspondingly stiff in their ideas of prices and are asking advances wherever possible. Shading is now out of the question and some makers will not name prices for any contracts running beyond December.

In finished material there has been rather a lull in new business, especially in structural steel. The aggregate of structural orders, however, during the past month has been so large that the mills are well filled for some time to come. In sheets, bars and plates, on the other hand, new business has been quite active. Bridge-building and ship-building orders have kept up to a large amount of business and manufacturers generally look forward to active fall work.

The strike of the Amalgamated Association is making very little commotion in the trade. Both parties seem determined, but the American Sheet and Tin Plate Company seems to have an advantage in that its non-union plants are running full, and these, with the accumulated stocks on hand, seem to be sufficient to supply all current requirements. The independent barmakers who made terms with the Association are generally running full.

Lake Superior Iron Ore—Shipments of iron ore from the Lake Superior region in June were 5,393,255 long tons, more than double those of June, 1908. For the season to June 30 the shipments by ports are reported by the Cleveland *Iron Trade Review*, as follows, in long tons:

	1908.	1909.	Changes.
Escanaba.....	260,245	1,132,233	I. 871,492
Marquette	119,014	420,224	I. 301,210
Ashland.....	271,577	612,024	I. 340,447
Superior	478,633	1,464,577	I. 985,944
Duluth.....	1,164,809	3,184,725	I. 2,019,916
Two Harbors.....	566,193	1,888,540	I. 1,322,347
Total.....	2,860,967	8,702,323	I. 5,841,356

As compared with 1907, the total shows a decrease of 3,983,307 tons.

Pig Iron Production—Reports from the furnaces, as collected by the *Iron Age*, show that on July 1 there were 239 coke and anthracite furnaces in blast, having a total weekly capacity of 463,700 tons. This is an increase of 17,100 tons over June 1, and of 61,700 tons over Jan. 1. The gain has been wholly in the steel company stacks, the merchant furnaces remaining about stationary. The estimated production of pig iron in June, making allowance for the charcoal furnaces, was

1,945,000 tons; for the six months ended June 30 it was 11,024,000 tons.

Baltimore

July 13—Imports for the week included 150 tons ferro-manganese from Germany; 1050 tons manganese ore from Great Britain; 10,800 tons iron ore from Cuba.

Birmingham

July 12—Southern pig-iron manufacturers are selling more than their make. Quotations have hardened to $12.50 per ton, No. 2 foundry, with an indication of a further advance in prices. The make in June showed a decided falling off, less than 100,000 tons being manufactured in Alabama. The stock reductions in June were heavy. Figures given out show that June 1 there were 170,000 tons of iron on furnace yards in this section, of which amount 90,000 tons belonged to brokers, consumers and others and awaited orders for delivery. On July 1 the figures showed 125,000 tons of iron on the yards, of which amount 50,000 tons belonged to the producers. One furnace has been blown in already this month and two others are nearly ready.

Work has started on getting plants of the Southern Iron and Steel Company ready for operation and by fall it is believed that the various plants will be in operation.

Chicago

July 13—General conditions in the pig-iron market are improving, the increased sales of last week being followed by a holding to higher prices by the leading furnace agents, and an awakening of the foundrymen to the fact that there will be no relapse, in all probability, the bottom of the market having been touched and passed. Large interests as well as the small are figuring on heavy supplies of both Northern and Southern iron. Contracts now being made are for fourth-quarter deliveries, with a few running into 1910. Aside from the few sales of large amounts to large consumers, the average sales have increased in size as well as in numbers. It seems to be realized that the improvement reflects at last the upward tone that has been manifested by the wholesale markets generally of this territory. Southern iron holds to $12.50, Birmingham ($16.35, Chicago), and Northern to $16.50@17 on No. 2, with the demand increased more strongly, perhaps, for Northern than for Southern.

The increase of sales of iron and steel products continues, with structural material and railroad supplies leading. The coke market is more active, with the best Connellsville remaining at $4.70, Chicago.

Cleveland

July 13—More buying of iron ore is reported, indicating that furnaces are seeing the necessity of providing for their future work. The June shipments of ore were nearly 5,400,000 tons. This was all done practically by the contract boats.

Pig Iron—There has been more selling locally and inquiries have been more numerous. Prices continue around $16 for bessemer; $15.50@15.75 for No. 2 foundry; $14.75@15 for gray forge.

Finished Material—One or two good bridge contracts have been closed. Plates are in demand. Bars are also active, and some independent makers have put up prices to a basis of 1.30c., Pittsburg,

Philadelphia

July 14—In a general way the pig-iron market has not begun to show signs of vitality. Iron for pipe-making purposes is an exception. Large orders have been placed and pipe-makers are now figuring on their purchases to see them through the later months of the year. The sales of basic iron are few. In other lines only trifling sales are reported. A few interior bar mills have just closed for forge iron for late delivery. The general view is that buying will soon set in and that the firmer tone in the market will be maintained. No 2X is $16.50; forge, $15.50; basic, $15.25 per ton.

Steel Billets—The market has quieted down and no transactions of moment are noted.

Bars—The work of repairing is drawing to an end and all mills in this territory will soon be on. Most mills have fair assortments which enable them to fill orders as fast as received. Store demand is light.

Structural Material—Several eastern railroads have placed orders within a few days for shapes aggregating 3800 tons. Further business is in sight.

Scrap—Dealers are not selling, and are not making any effort to increase their supplies. Railroad scrap is held too high.

Pittsburg

July 13—New business in steel products since the first of the month has been larger than was expected, considering the heavy buying and specifying before that date. There has, of course, been a decrease, but it is not as large as was expected, and with the large amount of business already booked the position of the market is favorable.

The Carnegie Steel Company's advance of $1 per ton in bars, plates and shapes has been followed by one or two concerns which were making occasional concessions, and the minimum of the market is now 1.25c. on bars and 1.35c. on plates and shapes, a clear advance of $1 per ton in the past 10 days. Some manufacturers will not book even at these prices. The minimum price of the Republic Iron and Steel Company is 1.30c. on bars.

There have been no important developments in the labor situation at the American Sheet and Tin Plate Company's plants. The Amalgamated Association has about a dozen organizers of its own, and half a dozen furnished by the American Federation of Labor, at work in the company's non-union mills, but without definite results. Officials of the tinhouse organization claim that their men will go out on the expiration of their scale, July 15. This organization has controlled the tinhouses at two or three of the plants now operating, though they are non-union as to the hot-mill department.

Pig Iron—New inquiry for foundry iron has been light, but the market is firm, on the basis of $15@15.25, Valley, for No. 2 foundry, $15.25 for malleable and $13.75@14 for gray forge. There is a possibility of some large transactions in bessemer, as it is thought probable the Jones & Laughlin Company will need some outside iron, in addition to the 25,000 tons recently purchased. Its new furnaces at Aliquippa are not likely to come in much before the close of the year and its present stocks are wholly or almost wholly basic. It is even rumored that the Steel Corporation may buy a large block of bessemer, but it can be stated that there are no active negotiations to this end. A sale of 500 tons of bessemer for prompt shipment is reported at $15.50, Valley, the price quoted in last report as the market. Inquiries for about 10,000 tons of basic have come out this week, for western consumers. The minimum on basic is $15, Valley, and this price is available only on early delivery, later deliveries commanding $15.25 or higher.

Steel—The market is firm, bessemer being at a minimum of $23 for billets and $25 for sheet-bars, with little available at those prices, while open-hearth steel is 50c. or $1 higher. With the recent withdrawal of the 1.30c. price by two or three interests the minimum of the plate market stands at 1.35c., Pittsburg.

Sheets—The market has grown still firmer, and prices of 2.20c. for black and 2.25c. for galvanized, for some time quoted as the nominal market, are now practically the minimum; there is still a little shading in corrugated material.

Ferromanganese—The market is stronger, $41, Baltimore, or $42.95, Pittsburg, being the minimum for prompt delivery, while prices range up to $42 and higher for deliveries extending into next year. The Jones & Laughlin Steel Company's purchases of ferromanganese in the past fortnight exceed 10,000 tons, covering the company to the middle of next year.

Foreign Iron

Belgian Iron Production—The production of pig iron in Belgium for the five months ended May 31 was 470,780 metric tons in 1908, and 601,950 tons in 1909; an increase of 131,170 tons.

Metal Markets

New York, July 14—The metal markets generally are inclined to be slow and rather uncertain in tendency. Consumption is on the increase, apparently, which is the encouraging feature.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal.	Exports.	Imports.	Excess.
Gold:			
May 1909..	$11,171,265	$ 2,263,721	Exp. $ 8,907,544
" 1908..	26,555,913	3,101,002	Exp. 23,454,911
Year 1909..	55,487,891	17,767,857	Exp. 37,720,034
" 1908..	44,891,257	22,958,223	Exp. 21,933,034
Silver:			
May 1909..	4,428,448	3,857,388	Exp. 571,060
" 1908..	4,028,334	3,389,568	" 638,766
Year 1909..	23,854,629	18,532,453	" 5,322,176
" 1908..	21,077,185	17,688,150	" 3,389,035

Exports from the port of New York, week ended July 10: Gold, $2,995,000, chiefly to Argentina; silver, $961,648, principally to London and Paris. Imports: Gold, $130,896; silver, $70,790, both from the West Indies, entral and South America.

Gold—There was no special demand for gold in the open market in London this week, and the price continued at the minimum, 77s. 9d. per oz. for bars. Most of the gold arriving was taken for Vienna account, a special demand having developed there. In New York $2,850,000 was taken for shipment to Argentina.

Platinum—The market continues very dull. While quotations are nominally $21.50@$22.50 for the refined metal, it is probable that orders of good size could be placed for the lower figure. The demand seems to be very slight at present, and manufacturers who are using much platinum appear to be well stocked up. Well informed persons in the trade do not look for any change until later in the year. Hard metal—platinum-iridium alloy—is higher, owing to the scarcity and high price of iridium, the advance over refined platinum being $3.75 instead of $2.50 as formerly. Hard metal is quoted $26 per oz. Scrap is $18 to $19 per ounce.

Silver—The London market has continued dull with some improvement the first of the week by buying on the Chinese banks. Upon cessation of this Chinese demand silver closes at 23 7/16d. in London, but is firm on buying by the Indian bazars.

SILVER AND STERLING EXCHANGE

July.	8	9	10	12	13	14
New York....	51¼	51	51⅛	51⅛	51	50⅞
London.....	23 7/16	23½	23 7/16	23⅜	23½	23 7/16
Sterling Ex..	4.8780	4.8775	4.8775	4.8765	4.8750	4.8720

New York quotations, cents per ounce troy, fine silver; London, pence per ounce sterling silver, 0.925 fine.

Exports of silver from London to the East, Jan. 1 to July 1, as reported by Messrs. Pixley & Abell:

	1908.	1909.	Changes.
India.....	£ 4,158,158	£3,040,900	D. £1,117,258
China.....	516,400	1,155,100	I. 638,700
Straits.....	90,510	82,800	D. 7,710
Total.....	£ 4,765,068	£4,278,800	D. £ 486,268

Copper, Tin, Lead and Zinc

July.	Copper. Lake, Cts. per lb.	Copper. Electrolytic, Cts. per lb.	Copper. London, £ per ton.	Tin. Cts. per lb.	Lead. New York, Cts. per lb.	Lead. St. Louis, Cts. per lb.	Zinc. St. Louis, Cts. per lb.
8	13¼ @13½	12⅝ @13	58 1/16	28⅞	4.30 @4.35	4 17½ @4.22½	5.22½ @5.27½
9	13¼ @13½	12⅝ @12⅞	58⅛	29⅛	4.30 @4.35	4 17½ @4.22½	5.20 @5.25
10	13¼ @13⅜	12⅝ @12⅞	....	29⅛	4.30 @4.35	4.17½ @4.22½	5 17½ @5.20
12	13¼ @13⅜	12⅝ @12⅞	...	29⅛	4 30 @4.32½	4.15 @4.17½	5 17½ @5.20
13	13⅜ @13⅝	12⅝ @12⅞	58	29	4.30 @4 32½	4 15 @4.17½	5.20 @5.22½
14	13½ @13½	12⅝ @12⅞	58 1/16	29⅛	4.30 @4.32½	4.15 @4.17½	5.20 @5.25

London quotations are per long ton (2240 lb.) standard copper. The New York quotations for electrolytic copper are for cakes, ingots and wirebars, and represent the bulk of the transactions made with consumers, basis, New York, cash. The price of cathodes is usually 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

Copper—During the week of July 8-15, the copper market has continued dull, sales having been of comparatively small value. The Calumet & Hecla is understood to be freely offering Lake copper at 13½c., and sales of some fancy brands have been made by other interests at that figure, but ordinary brands of Lake copper are easily obtainable upon lower terms. The market for Lake has been well sustained for the reason that comparatively little of this quality of copper is pressed for sale. This has led to an increased disparity between the price for it and electrolytic, conditions in the market for the latter kind of metal being quite different. The protracted dullness and the unfavorable statistics appear to have got on the nerves of some sellers, who have brought out some business by making sharp cuts in their previous quotations. However, the transactions have not been large, as consumers, either here or in Europe, do not yet show much interest. Although certain of the selling agencies continue to ask nominally a price that is far above the present market, the majority are free sellers at the concessions, and are anxious to take up such business as is offered.

The close is unchanged at 13¼@13½c. for Lake and lower for electrolytic in cakes, wirebars, or ingots, at 12⅝@12⅞c. The average for casting copper during the week has been 12⅝@12¾ cents.

The London standard market has been under pressure right along, but considering the light volume of consumptive business, has held its own fairly well. The close is cabled steady at £58 1s. 3d. spot and £ 58 15s. for three months.

Refined and manufactured sorts we quote: English tough, £61 10s.; best selected, £60 10s.@£61 10s.; strong sheets, £72 10s.@£74 10s.

Copper Producers' Association—The report of the Copper Producers' Association gives the following figures for June and the six months ended June 30, in pounds:

	June.	Six months.
Stocks, Jan. 1 and June 1.....	169,848,141	122,357,266
Production in U. S.	116.567,493	681,392,609
Total supplies..	286.415,634	803,749,875
Deliveries, d o m. and exp.....	131,557,573	648,891,814
Stocks, July 1..	154,858,061	154,858,061
Inc. or dec. in stocks	D. 14,990,080	I. 32,500,795

A supplementary statement from the Association gives deliveries for export and domestic use separately as follows, in pounds:

	June.	Six Mos.
Domestic deliveries.....	60,591,116	313,613,157
Export deliveries.....	70 966,457	335,278,657
Total.....	131,557,573	648,891,814

Tin—The market has been an uninteresting affair. Quotations here have ruled slightly below the London parity. Fluctuations have been narrow throughout the week, but there is a better tone perceptible at the close, same being cabled at £131 12s. 6d. for spot and £133 for three months. The market here is quiet at 29⅛ cents.

Lead—A great deal of pressure to market lead was exercised from St. Louis, and in the absence of demand from consumers prices gave way quickly, the close being quoted at 4.15@4.17½c. St. Louis, and 4.30@4.32½c. New York.

The London market has shaded off further, and the closing quotation is cabled at £12 11s. 3d. for Spanish and £12 13s. 9d. for English lead.

Spelter—The movements in the market have been rather erratic, due to the operations of speculators. Their selling brought about a decline, but after they had liquidated their holdings, the market showed good rallying power and closes firm at 5.20@5.25c. St. Louis, and 5.35@5.40c. New York.

New York quotations for spelter on July 8 were 5.37½@5.42½c.; July 9, 5.35@5.40c.; July 10, 5.32½@5.35c.; July 12, 5.32½@5.35c.; July 13, 5.35@5.37½c.; July 14, 5.35@5.40 cents.

The London market is quoted at £22 for good ordinaries and £22 5s. for specials.

Other Metals

Aluminum—The American producer offers ingot at 23c., but the metal is readily obtainable from abroad at 20½c., duty paid. We quote 20@23c. In Europe aluminum has lately sold at 12c., but there has been a little stiffening and the present price is about 12½c. There is talk of reviving the convention among the European producers.

Antimony—Business continues dull, chiefly on account of uncertainty as to the final decison on the tariff. In the absence of any but retail transactions, quotations remain nominal at 8⅜c. per lb. for Cookson's; 7⅝c. for Halletts; 7⅞c. for U. S., and 7⅜c. for outside brands.

Quicksilver—The New York price is $43.50@44 per flask of 75 lb. Business is fair. San Francisco quotations are $43.50 for domestic and $41.50 for export orders. The London quotation is lower at £8 5s. per flask, but jobbers sell at £8 1s. 3d. @ £8 2s. 6d. per flask.

Nickel—Large lots, contract business, 40@45c. per lb. Retail, spot, from 50c. for 2000-lb. lots, up to 55c. for 500-lb. lots. The price for electrolytic is 5c. higher.

Cadmium—Current quotations 75c. per lb., in 100-lb. lots, at Cleveland, Ohio. In Germany, 450@475 marks per 100 kg. at factory.

Magnesium—Quotations for this metal are $1.25 per lb., New York, in 100-lb. lots; for 5-lb. lots, $1.40 per pound.

Sault Ste. Marie Canal Traffic

The total tonnage passing through the Sault Ste. Marie canals, to and from Lake Superior, for the season to July 1 was, in short tons:

	1908.	1909.	Changes.
East-bound	3,937,509	9,334,789	I. 5,397,280
West-bound	2,064,816	2,782,578	I. 717,762
Total	6,002,325	12,117,367	I. 6,115,042

As compared with 1907 there was a decrease of 5,670,952 tons this year. Mineral freights included in the totals were, in short tons, except salt, which is in barrels:

	1908.	1909.	Changes.
Coal	1,761,875	2,341,532	I. 579,657
Iron ore	2,733,430	8,073,482	I. 5,340,052
Pig and man. iron.	86,966	128,125	I. 41,159
Copper	27,484	34,731	I. 7,247
Building stone	.....	880	I. 880
Salt, bbl	199,915	280,381	I. 80,466

Iron ore was 66.6 per cent. of the total freight this year, and coal 19.3 per cent.

Zinc and Lead Ore Markets

Platteville, Wis., July 10—The base price, this week, of 60 per cent. zinc ore was $44@44.50 per ton. For 80 per cent. lead ore $58 per ton was paid; one lot of 300 tons, mostly chunk lead, sold at $58 per ton.

SHIPMENTS, WEEK ENDED JULY 10.

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Platteville	716,753	.....	489,100
Hazel Green	399,500	.....	.....
Days Siding	264,000	.....	.....
Cuba City	238,115	.....	.....
Benton	207,650	.....	.....
Linden	205,350	.....	.....
Livingston	140,000	.....	.....
Harker	124,110	.....	.....
Galena	88,000	.....	.....
Strawbridge	66,000	.....	.....
Total	2,449,478	.....	489,100
Year to July 10	62,641,463	2,787,145	5,425,915

Highland is not reported. In addition to the above there was shipped to the American Zinc Ore Separating Company, 80,000 lb. and to the Joplin Separator Works, 64,000 lb. zinc concentrates.

Joplin, Mo., July 10—As high as $48 per ton was paid for one carload of zinc ore, the base price ranging from $45 early in the week, down to $42 at the week-end, with offerings of ore by sellers at $42 and no takers. No week for months has shown such light buying. Zinc silicate sold from $17 to $24.50. The average price, all grades, was $41.02 per ton. Lead ore declined to $52 at the week-end, the highest settling price being $53, with one sale made for next week's delivery at $54. The average price, all grades, was $52.14 per ton.

With the exception of the third week of January, the shipment of both zinc and lead ore was the lightest of the year and the value exceeds that week alone. It was a decrease of 1563 tons of zinc and 291 tons of lead ore, compared with the previous week.

SHIPMENTS, WEEK ENDED JULY 10.

	Zinc, lb.	Lead, lb.	Value.
Webb City-Carterville	2,674,290	236,490	$ 63,645
Joplin	2,230,360	163,570	53,362
Galena	526,320	73,660	13,257
Prosperity	312,500	167,400	11,070
Aurora	611,390	.....	10,014
Duenweg	443,710	16,260	9,496
Oronogo	459,360	5,090	7,828
Badger	344,270	4,490	7,349
Granby	392,340	5,440	5,780
Alba-Neck	232,520	.....	5,231
Quapaw-Baxter	239,410	.....	4,908
Spurgeon	178,280	56,530	4,696
Carthage	168,800	.....	3,220
Zincite	113,190	.....	2,498
Sarcoxie	111,760	.....	2,398
Miami	122,440	.....	2,143
Stott City	44,940	19,940	1,484
Jackson	57,080	.....	1,199
Totals	9,262,960	748,870	$209,578
28 weeks	315,281,930	48,788,750	$7,174,325

Zinc value, the week, $190,050; 28 weeks, $5,862,560
Lead value, the week, 19,528; 28 weeks, 1,311,765

MONTHLY AVERAGE PRICES

Month.	Zinc Ore. Base Price.		Zinc Ore. All Ores.		Lead Ore. All Ores.	
	1908.	1909.	1908.	1909.	1908.	1909.
January	$37.60	$41.25	$35.56	$38.46	$46.88	$52.17
February	36.63	36.94	34.92	34.37	49.72	50.50
March	36.19	37.40	34.19	34.71	49.90	50.82
April	35.40	38.63	34.08	37.01	52.47	55.63
May	34.19	40.06	33.39	37.42	56.05	56.59
June	33.06	44.15	32.07	40.35	60.48	57.52
July	34.55	.....	31.67	.....	59.90	.....
August	36.53	.....	33.42	.....	60.34	.....
September	37.63	.....	34.44	.....	54.59	.....
October	35.95	.....	33.28	.....	52.63	.....
November	39.13	.....	35.02	.....	54.53	.....
December	42.75	.....	39.63	.....	49.68	.....
Year	$36.63	.....	$34.31	.....	$53.93	.....

NOTE—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

Chemicals

New York, July 14—The general market is quiet, with only a moderate amount of business doing. Contract deliveries are fair.

Copper Sulphate—The market is steady and prices unchanged at $4.22½ per 100 lb. for carload lots, and $4.32½@4.47½ for smaller parcels.

Arsenic—This article is held at higher prices, on account of the duty of 2c. a pound proposed in the new tariff bill. Holders are firm and are asking 3.25@4c. per lb. for white arsenic. Sales have been light.

Nitrate of Soda—A good business is still being done and prices are firm at 2.15c. for spot and 2.12½c. for futures.

Potash Salts—The continuation of the German Potash Syndicate for five years and the part taken by American interests are noted elsewhere.

Phosphates—The new fertilizer trust, the organization of which was postponed some months ago, has now been completed. It will control a number of mines in Florida and Tennessee with manufacturing plants scattered throughout the South and East. A full list of these has not yet been published. The name of the company is the International Agricultural Corporation. Its capital stock is $15,000,000 and the officers chosen are: Waldemar Schmidtmann, Germany, president; H. C. Sickler, Wilkes Barre, Penn., vice-president; John W. Fry, Columbia, Tenn., secretary; R. M. Rownd, Buffalo, N. Y., treasurer; T. C. Meadows, New York, general manager.

Mining Stocks

New York, July 14—Summer time and a dull market are not always synonymous, but they seem to be so this year. On the Stock Exchange, fluctuations have been quite small and business has not been large. Prices, however, have been held pretty firmly, and no great changes can be reported. As a whole, the market has been devoid of interest. The only special feature was the strength of United States Steel.

On the Curb the same course was followed. The copper stocks were dull and in one or two cases fractional losses were made, although it cannot be said that there was any general downward candidship. Such losses as were recorded were only small. The Cobalt stocks were strong, and generally in better demand than any other securities. In the Nevada gold stocks there were large sales but considerable weakness developed in Goldfield Consolidated and some other stocks, which lost in price.

At auction sale June 30, in New York, 74 shares of Lanyon Zinc Company common and 111 shares of the preferred stock sold at $9 for the lot.

Boston, July 13—Sharp declines in North Butte again upset the market during the week, although there is little likelihood that prices would have done much had not the North Butte affair again presented itself. Fresh liquidation set in, which caused the stock to break to $47.25

Saturday, representing a decline of $8 in five days' time. It rallied to $51 the following Monday, but again became weak and settled to $48.50. The Street is as much perplexed at the antics performed by this stock as it has been at any time. One thing is certain and that is that bear manipulation has been a large factor in the continued weakness of the stock. The belief also predominates that the decline is not over yet.

Mohawk also had a bad break on the halving of the dividend to $1 for the six months. The stock records an extreme decline of over $8 for the week. This action was conservative, as earnings did not warrant a greater amount. Prices are all off for the weak from $1 to $3; it was not on account of any particular pressure, but rather from lack of demand. Summer dullness is at hand and not much can be expected.

Nipissing Mining stock has been placed on the regular list of the Stock Exchange, and showed slight hardening in price. Up to the present time this has been a Curb stock.

Ahmeek Mining made a new high on the Curb at $192 per share. There are but 50,000 shares and Calumet & Hecla owns all but a majority of the stock. Goldfield Consolidated had a $1.25 decline to $5.75 on free offerings of the stock due to diminished earnings. The Alvarado Mines' public offerings of 200,000 shares of treasury stock was undoubtedly successful and the stock all subscribed for, although formal announcement has not been made.

STOCK QUOTATIONS

NEW YORK July 14	
Name of Comp.	Clg.
Alaska Mine	.12
Amalgamated	81½
Anaconda	47½
Balaklala	‡2 1/16
British Col. Cop.	7⅜
Buffalo Mines	3⅛
Butte Coalition	24
Colonial Silver	⅛
Cum. Ely Mining	7⅛
Davis-Daly	5⅛
Dominion Cop.	7
Douglas Copper	2
El Rayo	2
Florence	3
Foster Cobalt	.32
Furnace Creek	.06
Giroux	8¾
Gold Hill	‡⅛
Goldfield Con	6¼
Granby	101
Greene Gold	⅛
Greene G. & S.	9
Guanajuato	1⅛
Guggen. Exp.	‡196
Hanapah	‡15
Kerr Lake	7⅛
McKinley Dar.	.84
Miami Copper	15½
Micmac	⅜
Mines Co. of Am.	⅛
Montezu. of C. R.	30
Mont. Sho. C.	⅛
Nev. Utah M. & S.	1⅞
Newhouse M. & S.	‡1⅝
Nipissing Mines	11
Old Hundred	⅛
Silver Queen	.35
Stewart	⅛
Tennessee Cop'r.	‡38¾
Tri-Bullion	⅛
United Copper	9⅛
Utah Apex	6⅛
Utah Copper	‡49⅛
Yukon Gold	4⅛

†Ex. Rights.

BOSTON July 14	
Name of Comp.	Clg.
Adventure	6¾
Allouez	41
Am. Zinc	28⅛
Arcadian	4
Arizona Com.	39
Atlantic	8½
Boston Con.	13¾
Calumet & Ariz.	101
Calumet & Hecla	635
Centennial	30
Copper Range	79¾
Daly-West	7¾
East Butte	11½
Franklin	16⅜
Greene—Can.	9⅝
Hancock	10⅛
Isle Royal	23⅛
Keweenaw	3½
La Salle	11
Mass.	7⅜
Michigan	10¼
Mohawk	58
Nevada	23⅛
North Butte	48¾
Ojibway	10¾
Old Colony	‡.60
Old Dominion	51⅛
Osceola	129
Parrot	30
Quincy	88
Rhode Island	‡4¾
Shannon	14⅛
Superior	39⅛
Superior & Bost.	14
Superior & Pitts.	15⅝
Tamarack	65
Trinity	11
U. S. Smg. & Ref.	48¾
U.S. Sm. & Re., pd.	49¼
Utah Con.	41
Victoria	4½
Winona	5
Wolverine	148
Wyandotte	2½

‡Last quotation.

N. Y. INDUSTRIAL	
Am. Agri. Chem.	‡46⅛
Am. Smelt. & Ref.	95⅝
Am. Sm. & Ref., pf.	112¼
Colo. Fuel & Iron.	44⅛
Federal M. & S., pf.	88¾
National Lead	86⅛
National Lead, pf.	‡107
Pittsburg Coal	‡11¼
Republic I. & S.	31¾
Republic I. & S., pf.	105
Sloss-Sheffield	82⅛
Standard Oil	‡685
U. S. Steel	69⅞
U. S. Steel, pf.	125⅝
Va. Car. Chem.	54¾

BOSTON CURB	Low.
Ahmeek	187
Chemung	14
Chino	7¾
Corbin	7⅛
Globe Con	4⅛
Helvetia	5⅛
Ray Central	2¼
Ray Con.	16⅛
San Antonio	10¾

Furnished by Hornblower & Weeks, N. Y.

ST. LOUIS July 10		
N. of Com.	High.	Low.
Adams	.40	.30
Am. Nettie	.10	.07
Center Cr'k	1.75	1.50
Cent. C. & C.	82.00	81.00
C. C. & C. pf.	81.00	80.00
Cent. Oil	105.00	100.00
Columbia	9.00	8.00
Con. Coal	19.00	18.00
Doe Run	110.00	100.00
Gra. Bimet.	.28	.20
St. Joe	13.00	12.00

LONDON July 14			
Name of Com.	Clg.		
Dolores	£1	5s	0d
Stratton's Ind.	0	3	1½
Camp Bird	1	9	0
Esperanza	3	0	0
Tomboy	1	1	3
El Oro	1	5	3
Oroville	0	12	6

Cabled through Wm P. Bonbright & Co., N. Y

NEVADA STOCKS. July 14.
Furnished by Weir Bros. & Co., New York.

Name of Comp.	Clg.
COMSTOCK STOCKS	
Belcher	.42
Best & Belcher	‡ .40
Caledonia	‡ .22
Challar	.19
Comstock	.26
Con. Cal. & Va.	.77
Crown Point	‡ .47
Exchequer	‡ .27
Gould & Curry	.17
Hale & Norcross	.25
Mexican	1.03
Ophir	1.40
Overman	‡ .32
Potosi	31
Savage	.21
Sierra Nevada	.26
Union	.47
Utah	.04
Yellow Jacket	.77
TONOPAH STOCKS	
Belmont	.85
Extension	.48
Golden Anchor	‡ .51
Jim Butler	09
MacNamara	.24
Midway	.20
Montana	.60
North Star	.02
Tono'h Mine of N.	6.62½
West End Con.	.20
GOLDFI'D STOCKS	
Adams	.01
Atlanta	.10
Blue Bell	.02½
Booth	.11
C.O.D. Con.	.11
Columbia Mt.	.10
Comb. Frac.	.60
Con. Red Top	‡ .57
Cracker Jack	.02
Dia'dfield B. B. C.	.03
Goldfield Belmont	.04
Goldfield Daisy	.26
Great Bend	.05
Jumbo Extension	.10
Kendall	02
Lone Star	.03
May Queen	.03
Oro	.06
Red Hill	.05
Sandstorm	08

Name of Comp.	Clg.
Silver Pick	.10
St. Ives	.10
Triangle	.01
BULLFROG STOCKS	
Gibraltar	02
Homestake King.	.01
Mont. Shoshone C.	1.50
Tramp Cons.	.05
MISCELLANEOUS	
Cumberland Ely	7.87½
Giroux	7.62½
Greenwa'r Copper	.05
Nevada Con.	23.12½
Nevada Hills	.87½
Nevada Smelting.	1.00
Nevada Wonder	.40
Nevada-Utah	1 87½
Penn-Wyoming	...
Pittsburgh S. Pk.	47
Ray Central	2 43¾
Ray Con.	16.75
Round Mt. Sphinx	10

COLO. SPRINGS July 9	
Name of Comp.	Clg.
Acacia	.07
C. C. Con.	‡.03½
Dante	‡.05½
Doctor	.09¼
Elkton	.65¼
El Paso	.54⅞
Findlay	‡.14
Gold Dollar	.11⅝
Gold Sovereign	.03¾
Isabella	.22½
Jack Pot	.07
Jennie Sample	‡.07½
Jerry Johnson	.06¾
Lexington	‡.02
Mary McKinney	.40½
Pharmacist	.03
Portland	.75
U. G. M.	.05¾
Vindicator	61
Work	‡06.¼

Assessments

Company.	Delinq.	Sale.	Amt.
Alpha, Nev.	July 15	Aug. 6	$0.05
Best & Belcher, Nev.	July 20	Aug. 10	0.10
Brunswick Chol., Nev.	July 10	Aug. 2	0.01
Brunswick Potosi, Nev.	July 10	Aug. 2	0.01
Bullion, Nev.	June 14	July 13	0.05
Caledonia, Nev.	July 23	Aug. 13	0.05
Challenge Con., Nev.	June 22	July 13	0.05
Gold Mt. Champion, Utah.	July 26	Aug. 10	0.00½
Mexican, Nev.	June 28	July 14	0.10
Mountain Dell, Utah.	July 19	Aug. 5	0.01½
N. Y. Bonanza, Utah.	July 10	July 31	0.03
Potosi, Nev.	July 9	Aug. 2	0.10
Progressive, Utah.	June 23	July 14	0.01
Scottish Chief, Utah.	July 7	Aug. 4	0.01
Seg. Belcher, Nev.	July 7	July 29	0.03
Seven Troughs Min., Nev.	June 23	July 10	0.00½
Sierra Nevada, Nev.	July 15	Aug. 10	0.10
Silver King Con., Utah.	July 6	July 17	0.10
Union Con., Nev.	June 28	July 19	0.10
W. Con. Va., Nev.	July 16	Aug. 10	0.10
Yellow Jacket, Nev.	July 13	Aug. 5	0.25

Monthly Average Prices of Metals

SILVER

Month.	New York.		London.	
	1908.	1909.	1908.	1909.
January	55.678	51.750	25.738	23.834
February	56.000	51.472	25.855	23.706
March	55.365	50.468	25.570	23.227
April	55.505	51.428	25.133	23.708
May	52.795	52.905	24.377	24.343
June	53.663	52.538	24.760	24.166
July	53.115	.....	24.514	.....
August	51.683	.....	23.858	.....
September	51.720	.....	23.877	.....
October	51.431	.....	23.725	.....
November	49.647	.....	22.933	.....
December	48.766	.....	22.493	.....
Year	52.864	.....	24.402	.....

New York, cents per fine ounce; London, pence per standard ounce.

COPPER

	NEW YORK.				LONDON.	
	Electrolytic		Lake.			
	1908.	1909.	1908.	1909.	1908.	1909.
January	13.726	13.893	13.901	14.280	62.386	57.688
February	12.905	12.949	13.098	13.295	58.786	61.198
March	12.704	12.387	12.875	12.826	58.761	56.231
April	12.743	12.56½	12.928	12.93½	58.331	57.363
May	12.598	12.893	12.788	13.238	57.387	59.338
June	12.675	13.214	12.877	13.548	57.842	59.627
July	12.702	.....	12.933	.....	57.989	.....
August	13.462	.....	13.639	.....	60.500	.....
September	13.388	.....	13.600	.....	60.338	.....
October	13.354	.....	13.646	.....	60.139	.....
November	14.130	.....	14.386	.....	63.417	.....
December	14.111	.....	14.411	.....	62.943	.....
Year	13.208	.....	13.424	.....	59.902	.....

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling, per long ton, standard copper.

TIN AT NEW YORK

Month.	1908.	1909.	Month.	1908.	1909.
January	27.380	28.060	July	29.207	.....
February	28.978	28.290	August	29.942	.....
March	30.577	28.727	September	28.815	.....
April	31.702	29.445	October	29.444	.....
May	30.015	29.225	November	30.348	.....
June	28.024	29 322	December	29.154	.....
			Av. Year.	29.465	.....

Prices are in cents per pound.

LEAD

Month.	New York.		St. Louis	London.	
	1908.	1909.	1909.	1908.	1909.
January	3.691	4.175	4.025	14.469	13.113
February	3.725	4.018	3.868	14.250	13.313
March	3.838	3.986	3.835	13.975	13.438
April	3.993	4.168	4.051	13.469	13.297
May	4.253	4.287	4.214	12.938	13.225
June	4.466	4.350	4 291	12.600	13.031
July	4.744	.....	.....	13.000	.....
August	4.580	.....	.....	13.375	.....
September	4.515	.....	.....	13.125	.....
October	4.351	.....	.....	13.375	.....
November	4.330	.....	.....	13.538	.....
December	4.213	.....	.....	13.156	.....
Year	4.200	.....	.....	13.439	.....

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month.	New York		St. Louis.		London.	
	1908.	1909.	1908.	1909.	1908.	1909.
January	4.513	5.141	4.363	4.991	20.563	21.425
February	4.788	4.889	4.638	4.739	20.875	21.563
March	4.665	4.757	4.527	4.607	21.075	21.436
April	4.645	4.965	4.495	4.815	21.344	21.531
May	4.608	5.124	4.458	4.974	19.906	21.975
June	4.543	5.402	4.393	5.252	19.000	22.000
July	4.485	.....	4.338	.....	19.031	.....
August	4.702	.....	4.556	.....	19.350	.....
September	4.769	.....	4.619	.....	19.563	.....
October	4.801	.....	4.651	.....	19.750	.....
November	5.059	.....	4.909	.....	20.875	.....
December	5.137	.....	4.987	.....	20.625	.....
Year	4.726	.....	4.578	.....	20.163	.....

New York and St. Louis, cents per pound. London, pounds sterling per long ton.